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The role of the oral surgeon in a general hospital in war

■ *Thomas J. Cook, D.D.S., Miami, Fla.*

Oral surgery was the first specialty to be evolved from dentistry. In 1867, under Garretson's leadership, the Philadelphia Dental College instituted the first course in oral surgery. In the writings of Garretson[1] may be found the following expression relative to oral surgery: "Just where such a specialty shall begin, what it shall include, and where it will find its limitations, will depend, as in the practice of any other specialty, on the inclinations and capabilities of the man concerned."

The function of a general hospital in the care of the wounded may be considered twofold: to apply further and more definite surgical treatment which would permit the patient to return to duty within a period of a few months or, if the soldier's injury precludes his return to duty or will require prolonged hospitalization, to prepare the patient for evacuation to this country.[2]

Gunshot wounds are usually penetrating wounds in which the missile has entered the body without emerging from it, or perforating wounds in which the missile has left a wound of entry and a wound of exit.

The wounding effects of a bullet depend on the amount of energy it transmits to the tissues, the velocity of the transmission, the direction of the transmitted energy and the density of the tissues.[3] (See Figure 1.)

Machine gun and rifle bullet wounds, according to Blair and Ivy,[4] usually consist of a small clean wound of entry, and a larger wound of exit, the amount of injury to the intervening tissues depending upon the parts involved.

The difference between wartime and peacetime fractures of the jaws is that most of the former are comminuted and complicated by serious wounds of the soft tissues;[5] however, as Blair[6] points out,

Photographs were made by the Museum and Medical Arts Service, U. S. Army Medical Museum.

1. Carr, M. W., The Status of Oral Surgery as a Specialty of Dentistry. *J. New York Acad. Dent.* 2:33 (March) 1935.

2. Kirk, N. T., Surgical Care of the Wounded in the United States Army. *Surgery* 15:211 (Feb.) 1944.

3. Callender, G. R., Wound Ballistics. *War Med.* 3:337 (April) 1943.

4. Blair, V. P., Ivy, R. H., and Brown, J. B., *Essentials of Oral Surgery*, ed. 2. St. Louis: The C. V. Mosby Company, 1936.

5. Fairbank, L. C., and Ivy, R. H., Emergency Treatment and Primary Apparatus for Fractures of the Jaws in Warfare. *Mil. Surgeon* 86:124 (Feb.) 1940.

6. Blair, V. P., Symposium on Plastic Surgery; Treatment of Battle Casualties and Street or Industrial Wounds of the Face. *Surgery* 15:16 (Jan.) 1944.

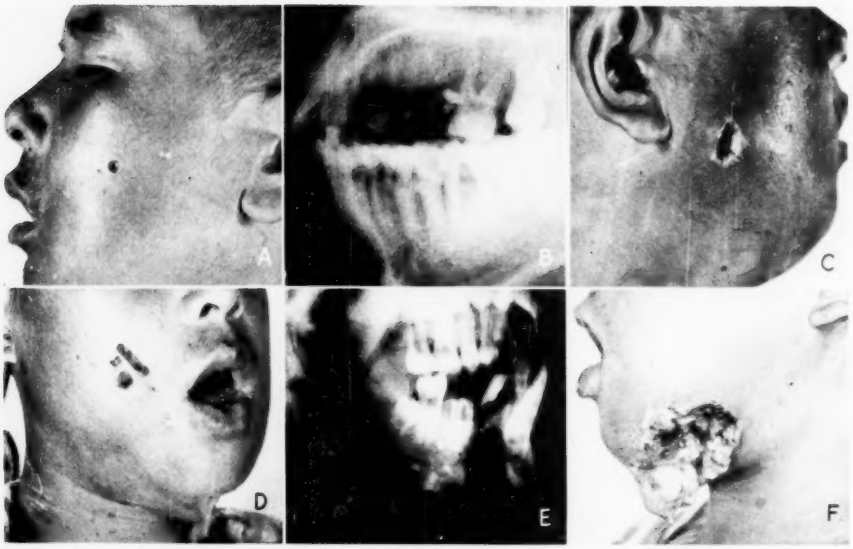

Fig. 1.—Rifle bullet wounds of exit may be large or small, depending on the density of the tissues in the path of the bullet. A: Small wound of entrance. B: Destroyed teeth. C: Small wound of exit. D: Small wound of entrance. E: Destroyed mandible. F: Large wound of exit.

"early accurate replacement and fixation of distorted bone and damaged, cut or torn face tissues will on the average give a quite acceptable, if not really good restoration within a period to be measured by weeks or even months."

■ *Maxillofacial Surgery Cases*

During World War II the Twentieth General Hospital was designed to receive and treat the maxillofacial cases at the beginning of the Burma campaign. In cooperation with the general surgical member of the team, Major Henry Royster, M.C., a program was set up which functioned most satisfactorily during the months which followed. The ambulatory patients were seen in the dental clinic daily, others were seen in the ward by an oral surgeon.

Shortly after the arrival of our first maxillofacial cases a meeting was called of all dental officers in the area by the base dental surgeon. This meeting was held in the dental clinic of the Twentieth General Hospital, and was attended by 40 officers. The cases in the hospital were presented and treatment discussed. At the request of the officers present a similar meeting was held on the last Friday of each month. A program in which we felt the oral surgeon should be capable of participating, was set up for the early and late care of maxillofacial cases.

EARLY TREATMENT AT PORTABLE HOSPITAL—Provide for an adequate respiratory airway; if there is loss of control of the tongue there may be danger to respiration. This is best controlled by exerting traction on the tongue by means of a long suture, or a safety pin, passed through the tip of the tongue. The tongue can be drawn forward and the suture attached to the dressing. These considerations are particularly important if the patient is unconscious.

Arrest hemorrhage. Moderate hemorrhage usually can be checked by inserting a gauze pack into the wound and holding it in place by a four tailed bandage. Hemorrhage that cannot be checked in this way demands a search for a bleeding vessel and application of a clamp to it. The vessel is tied off but if ligature material is not available, leave the clamp on during transportation.

Treat shock, if possible.

Débridement, as understood concerning wounds of other parts of the body, is less radical in the management of wounds of the face. Shreds of obviously devitalized tissues are cut away, but displaced flaps of tissue may be sutured back into approximate position. Edges of skin and mucous membrane in large wounds communicating with the mouth should be sutured together so as not to leave raw surfaces and bone exposed. Great care should be taken to avoid injuring branches of the seventh nerve and the salivary duct.

Do not remove fragments of bone which have any attachment to soft tissue.

Chemotherapy should be instituted.

A complete record of treatment should accompany the patient; that is, drugs used, foreign body removed, and so forth.

Positions on a litter for moving patients with injuries of the jaw are: side with head on side; prone with head on side, or prone with face down, head supported on a sling.

TREATMENT AT FIXED HOSPITAL—Every possible facility in the way of equipment and special personnel for proper care of the patients is provided in the general hospital. The program of management can be grouped under the following headings:[7]

1. Complete record of history to date.
2. General medical and physical survey to include all injuries and conditions of disease that may be present, especially acute respiratory and other infections.
3. Laboratory procedures, such as examination of blood and urine, bacteriologic cultures and other measures.
4. Special maxillofacial survey. This examination is to be conducted jointly by the general surgeon and the oral surgeon and consists of: (*a*) complete clinical examination of the region involved in the injury; (*b*) roentgenologic examination of the bones of the face and jaw, intraoral, extraoral, stereoscopic, roentgenoscopic, and others as indicated; (*c*) record of observations.

The foregoing survey will reveal: structures involved in the injury to soft tissue; inflammatory conditions of the soft tissues; presence of foreign bodies; injuries to the teeth; location and extent of fractures of the bones of the jaw and neighboring bones, orbits, paranasal sinuses and nasal fossae; infection of bone.

7. *Plastic and Maxillofacial Surgery*. Philadelphia: W. B. Saunders Co., 1942.

Treat all fractures of the jaws as emergencies; the general treatment of the patient has preference. Use the simplest form of reduction. Have patient report to the dental clinic daily when possible, and keep careful records.

Fractures of the mandible are more common than fractures of the maxilla and may be: (1) simple; (2) multiple; (3) comminuted and complicated with other injuries; (4) in combination with fractures of the maxilla, face and head. Intermaxillary ligation is the treatment of choice for simple fractures.

Treatment of complicated fractures depends on the nature of the fracture. Fragments of bone with tissue attachments should not be removed.

Fractures of the maxilla are frequently associated with serious injury of the bones of the head and face. Simple fractures may be handled with intermaxillary ligation. Extraoral traction may be necessary when treating complicated fractures.

Fractures of the jaws which have not been perfectly reduced and fixed may unite in the position assumed by the fragments after the injury. It may be possible to reduce the fragments to the normal position by gradual elastic traction, if treatment is instituted before consolidation is complete.

The primary object of treatment is the restoration of function; to accomplish this, the former occlusal relationship of the remaining teeth should be established.

■ *Responsibility in Oral Surgery*

In 1941 Carr,[8] in a committee report to the American College of Dentists, wrote, "At the present time when mobilization is being considered as a vital part of national defense, it is already recognized that the Army and Navy shall not only require but are anxious to know of men who are particularly trained in any of the specialized fields, and of these, oral surgery seems to be the most important."

According to the Dental Division, Office of the Surgeon General,[9] the requirements for an MOS of Oral Surgery are "Should be thoroughly familiar with all laboratory procedures involved in the care of oral surgery patients. . . . Should have background of extensive experience in oral surgery and have been a member of a hospital staff. An internship, fellowship, or residency in a recognized hospital or other institution is desirable. . . ."

During the war I was associated with a general hospital. I mention this because it was necessary to formulate a plan of treatment before the beginning of a certain campaign. In cooperation with the general surgeon, a program was set up which functioned most satisfactorily.

As the oral surgeon, I assumed responsibility for the patients with wounds involving the jaw bones and supporting structures. I saw the patients on admission, removed the dressing, examined the wounds and wrote the history.

When immediate treatment was required I worked at the operating table with the general surgeon and assumed responsibility for the postoperative care of the patient. If the patient was ambulatory he was seen daily in the oral surgery section which was set up separate from the

8. Carr, M. W., Oral Surgery. *J. Am. Col. Den.* 8:36 (March) 1941.
9. Personal communication.

dental clinic; if he was bedridden he was seen daily in the ward.

Toward the end of the war, where several hundred patients with injuries of the face and jaw bones were under treatment I had access to the records and saw patients from every theater of war. The names of the oral surgeons who treated the cases became familiar to me. Their records were good and there was nothing but praise from the patients.

Ivy[9] stated,

> Experience in the care of injuries of the face and jaws occurring in the War of 1914-1918 has brought out certain fundamental principles which should be observed if the best results are to be obtained in treatment. The soundness of these principles has been adequately demonstrated in the succeeding years with a very large number of comparable cases in peace time. After the return to hospitals in this country in 1919 of cases of maxillofacial injury, it was generally possible to determine which of them had received treatment governed by these principles from the beginning, and which, on account of military exigencies or by lack of experience on the part of the surgeons to whom they were assigned had not received such treatment.

Parker,[10] who served as a civilian consultant during World War II, stated that,

> the first observation is in great contrast to the observation of World War I in that the incidence of infection of the soft tissues and the bone is lower . . . the second observation is that there has been more intelligent effort to stabilize the bones of the face and jaws in a more nearly normal, anatomic relationship.

It is natural to feel that it was the mutual understanding between the general surgeon and the oral surgeon as to the part each should play and the responsibility each should assume that made the maxillofacial services function so well.

Waldron[11] said,

> the high standard of surgical care in World War II and the excellent results thereby secured have been largely due to the broad policies and the guiding principles presented from time to time by the professional division of the Surgeon General's office. The accumulated data of extensive experience have confirmed the soundness of certain principles and have formed the basis of modification of others. This holds true of maxillofacial surgery which has been covered by teams consisting of plastic and dental oral surgeons. This efficient and cooperative teamwork should not terminate with war activities. It can be continued and developed in the care of civilian and industrial accidents, to the great advantage of the patients concerned. By and large, civilian patients with extensive lacerated facial wounds, associated with compound fractures, have not had such efficient and skilful care as that of the maxillofacial units of the services, which has been progressively modified and improved.

■ *Case 1*

A soldier, aged 24, was injured by a 0.25 caliber rifle bullet on May 31, 1944. He was given emergency treatment in a forward medical installation and evacuated by air to a general hospital the same day.

EXAMINATION—Physical examination revealed a perforating gunshot wound of the face. The missile entered the chin, fractured the mandible and the wound of exit was in the neck on the right side (Fig. 2, *A*). The mandibular central incisor teeth were loose. On palpation a fracture could be demonstrated at the symphysis and there was numbness of the lower lip. There was an effusion of blood into the tis

10. Parker, D. B., Observations on the Definitive Treatment of Maxillofacial Injuries, *J.O.S.* 3:320 (Oct.) 1945.

11. Waldron, C. W., Maxillofacial Wounds (editorial), *J.O.S.* 3:269 (Oct.) 1945.

sues beneath and directly posterior to the chin.

The roentgenographic examination showed a compound, comminuted fracture of the mandible at the symphysis extending to the right of the midline (Fig. 2, *B*). The fracture line extended into the central incisor region. There was considerable fragmentation of the inferior border of the mandible, but its general configuration was not too distorted.

TREATMENT AND COURSE—On admission the face and neck were scrubbed with green soap and water. The wounds were carefully searched for foreign material. A Penrose drain was inserted into the neck wound, and both wounds were dusted with sulfonamide crystals and dressed. Penicillin therapy was instituted.

On June 1, interdental wires were placed on the maxillary and mandibular teeth. The teeth were brought into occlusion with elastic traction.

The dressings were changed daily and the mouth was cleansed by spray. The drain was removed from the neck wound on the fifth day. The elastic bands were

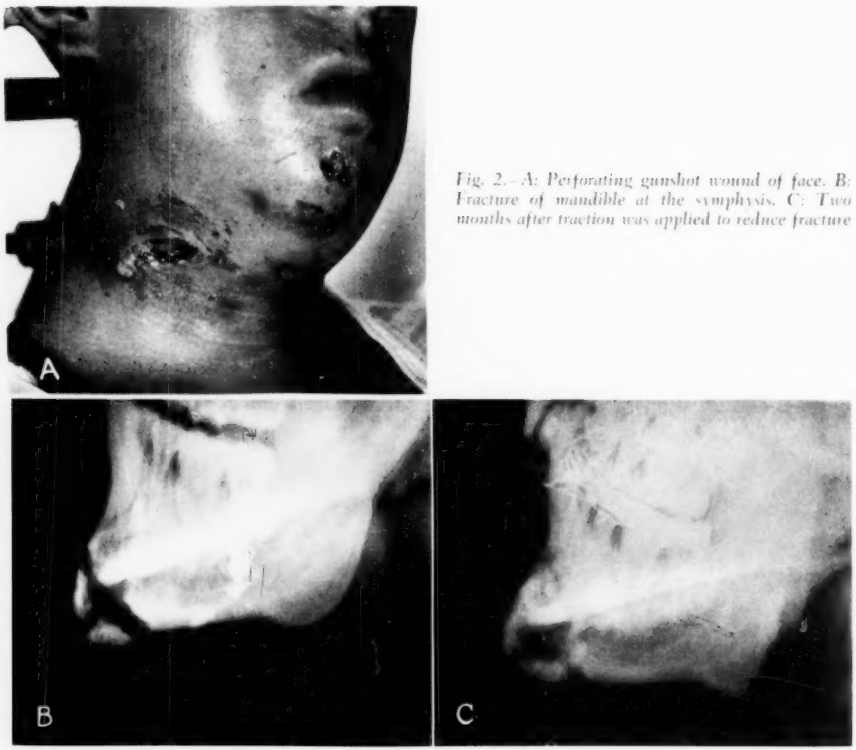

Fig. 2.—A: Perforating gunshot wound of face. B: Fracture of mandible at the symphysis. C: Two months after traction was applied to reduce fracture

changed when necessary and penicillin was administered for seven days. The swelling directly beneath the chin subsided completely. An acrylic chin support was then applied and pressure applied to the chin in order to aid in the reduction of the fractures at the symphysis.

The patient was fed a liquid diet which consisted of evaporated milk, dehydrated eggs, syrup, brewers' yeast and cod liver oil. Cevitamic acid was supplemented. The caloric value was 28.5 per cc.

The wounds of the neck and chin were healed by the fifteenth day (June 15) after admission.

Two months after admission, roentgenographic examination revealed bone union at the site of fracture (Fig. 2, *C*). The elastic traction was then removed and the patient was given a soft diet for one week. Convalescence was uneventful and the interdental wires were removed, the necessary dental restorations were completed and the patient was discharged to duty 70 days after admission to the hospital.

■ *Case 2*

A soldier, aged 27, was wounded by mortar shell fragments on June 12, 1944. He was lost in the jungles for four days and an advance medical installation recorded "two superficial wounds grooving back over scapula area, one on left shoulder, and one through the left submental area, which was full of maggots. The patient's wounds were cleansed and dressed before he was evacuated to a general hospital.

EXAMINATION—Examination at a general hospital on June 16, 1944, revealed a perforating gunshot wound in the submental region, 3 cm. left of the midline, traversing the soft tissues of the cheek. The wound of exit was in the left upper lip, 1 cm. from the angle of the mouth (Fig. 3, *A*). The wounds were moderately infected.

Roentgenograms showed a fracture of the alveolar process in the region of the maxillary left central and lateral incisor teeth and the mandibular left cuspid tooth, with loss of these teeth (Fig. 3, *B*).

TREATMENT—The wounds were thoroughly cleansed with Chlorazene and several maggots were removed from the lip wound. Several small pieces of bone were removed from the wound intraorally. After several days when the lip wound was clean, secondary suturing was done. The wound in the submental region was closed after cleansing with the Chlorazene solution.

Fifteen days after admission impressions were made of the maxillary and mandibular teeth and the missing teeth were replaced.

The patient was returned to duty 20 days after admission.

COMMENT—A great deal of pleasure was derived from the fact that in a dental clinic with minimum equipment in a foreign land the necessary dental restorations could be made.

■ *Case 3*

A soldier, aged 24, was injured by shell fragment, May 29, 1944. The patient said he was treated in two forward hospitals and that two pieces of shell were removed, one under his tongue, and one from his back. There is no record of such

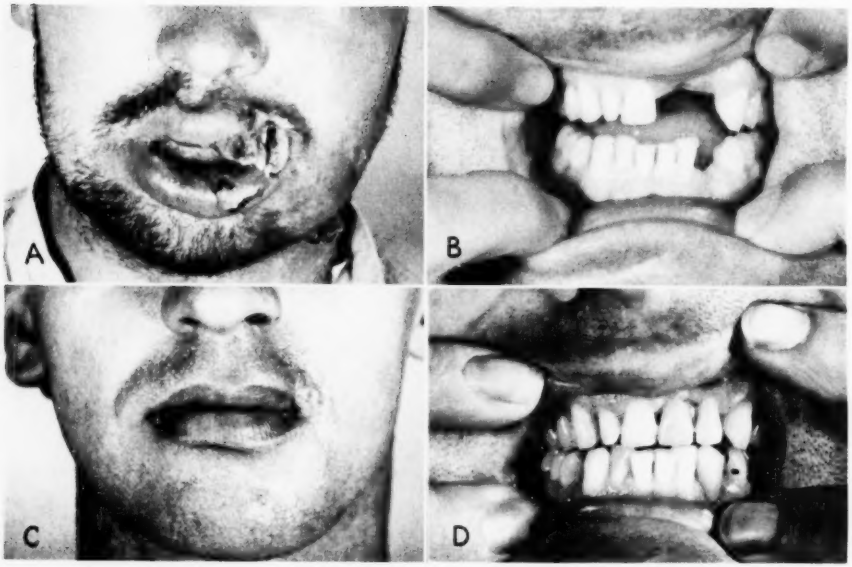

Fig. 3.—A: Gunshot wound of face. B: Loss of anterior teeth. C: Appearance of patient after repair. D: After replacement of missing teeth

treatments. A note from a clearing company said, "Dressed and sulfathiazole."

EXAMINATION—Examination on June 1, 1944, at a general hospital, showed a clean, moderately severe, penetrating wound of the right jaw (Fig. 4, *A*). The missile penetrated the soft tissues, fractured the mandible, destroyed the right central and lateral incisors, cuspid, first and second bicuspids, fractured the left central incisor, and lodged in the floor of the mouth. There was also a severe, lacerating wound of the right scapula region.

Roentgenograms taken June 4, 1944, showed almost complete destruction of the horizontal ramus of the mandible on the right side (Fig. 4, *B*). Two molar teeth were all that remained in the proximal fragment, which was rotated upward. There was considerable loss of bone substance and distortion of the residual fragments. No foreign bodies were present.

TREATMENT—On admission to the general hospital the wound was cleansed and sutured, and pressure bandages were applied which also supported the fractured mandible. Chemotherapy was started immediately.

On June 8 a loose piece of mandible and the fractured distal root of the first molar were removed through the intraoral wound, under procaine anesthesia. Im-

pressions were made of the chin and an acrylic chin support was designed.

Interdental wires were applied to the maxillary and mandibular teeth on June 10. The teeth were brought into occlusion with elastic bands. The acrylic chin support was attached by elastic bands to the ties of an operating room mask and slung over the vertex of the head, bringing direct pressure upon the displaced fragment of the mandible. The patient was seen daily for adjustment of the appliances.

Figure 4, C shows the patient after surgical repair. A roentgenogram taken on

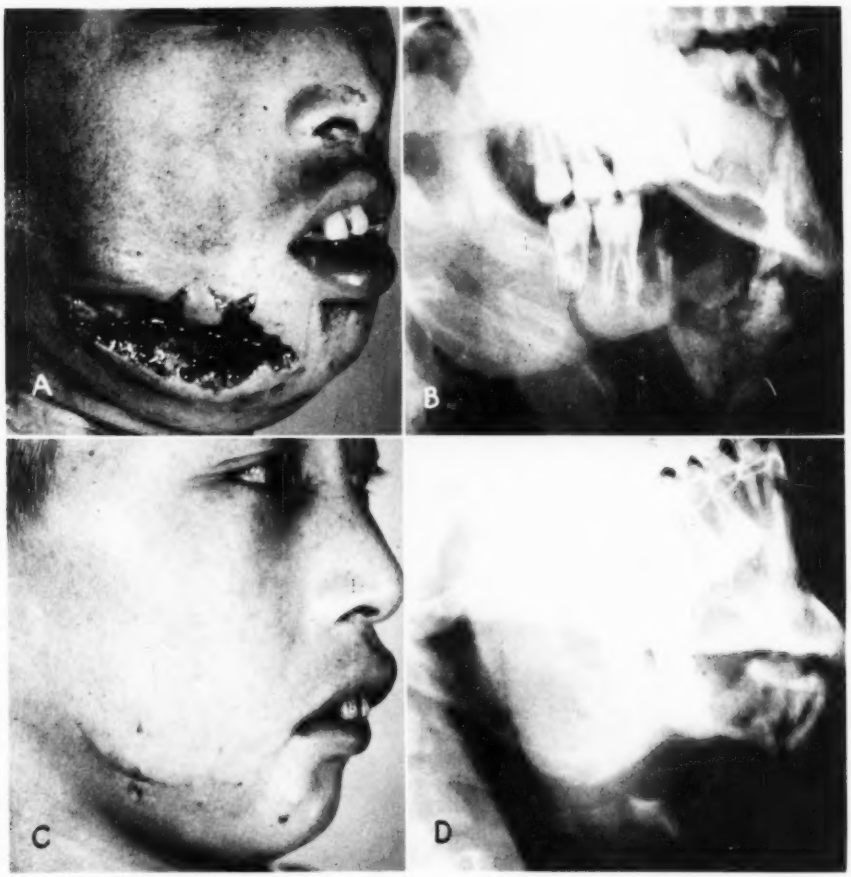

Fig. 4.—A: Penetrating wound of face. B: Fracture of mandible. C: After surgical repair. D: Bone union in mandible

July 27 revealed evidence of bone union (Fig. 4, *D*).

The interdental wires were removed on July 29, and impressions were made for a prosthetic appliance to supply the missing molar teeth. The appliance was inserted August 4.

REMARKS—The wound was clean on admission and was closed immediately. The use of the acrylic chin support in addition to the interdental wiring played an important role in this case.

■ *Case 4*

A soldier, aged 21, was injured by a mortar shell fragment on June 14, 1944. He was treated at a forward medical installation and then evacuated by air to a general hospital on the day of injury.

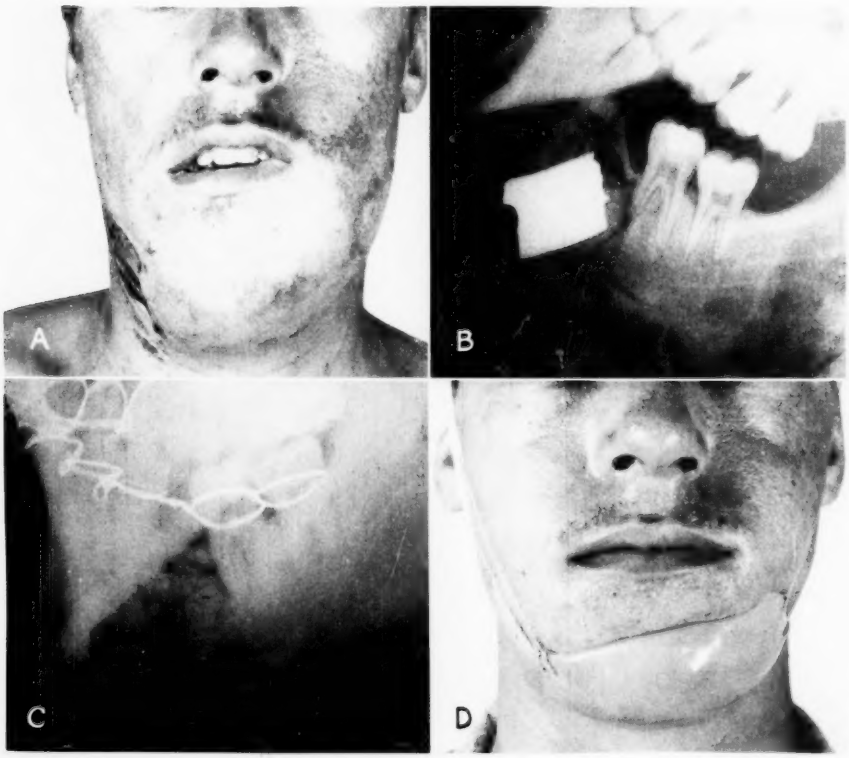

Fig. 5.—A: Wound in right submandibular region. B: Shell fragment lodged in the mandible. C: After removal of fragment and application of interdental wires. D: Acrylic chin support in position

Fig. 6. Left: Appearance of patient after treatment. Right: Bone union demonstrated.

EXAMINATION.—The severe, clean wound of entrance was in the right submaxillary region. The missile traversed beneath the tongue and fractured the mandible on the opposite side. There was ecchymosis beneath the tongue and considerable swelling beneath the mandible on both sides (Fig. 5, *A*). The fracture of the left mandible was compound, comminuted, severe and clean.

A roentgenogram showed the comminuted fracture of the horizontal ramus of the left mandible, extending from a point just lateral to the midline back as far as the first molar. A shell fragment 20 by 15 by 12 mm. was lodged on the lingual side of the mandible (Fig. 5, *B*).

TREATMENT.—The wounds were cleansed and dressed, and chemotherapy with sulfonamide drugs and penicillin was started. The patient could take liquids.

Interdental wires were applied to the maxillary and mandibular teeth, and the teeth were brought into occlusion with elastic bands. The ecchymosis beneath the tongue had subsided by June 26. The shell fragment was removed intraorally under procaine anesthesia (Fig. 5, *C*).

An acrylic chin support was designed and attached by rubber bands to the four ties of an operating room mask which was slung over the vertex of the head (Fig. 5, *D*). It was possible with this appliance to apply pressure to the inferior border of the mandible and thereby restore the fractured parts to normal position.

The elastic traction was removed on August 20, and the interdental wires were removed the following day (Fig. 6, left). Roentgenograms demonstrated bone union (Fig. 6, right).

The necessary dental repair was completed.

COMMENT.—This soldier was most cooperative and requested to remain on foreign duty. Ten weeks after his injury he was discharged and assigned to duty with the general hospital.

■ *Case 5*

A soldier, aged 25, was injured by mortar shell fragments on March 11, 1944. He was lost in the jungles for several days and finally tagged at a forward medical installation and immediately sent to a general hospital.

EXAMINATION.—Examination revealed a severe, penetrating wound of the face and neck with myiasis (Fig. 7, *A*). The fragments entered the right submental region, traversing and lacerating extensively skin of the chin and anterior neck region, and lodged in the soft tissues of the left side of the neck. There was a complete compound, comminuted fracture of the mandible at the symphysis. The maxillary and mandibular right central incisors were missing. Moderately severe osteomyelitis of the mandible at the symphysis was noted. The cause was undetermined.

The left hand was also injured.

Roentgenograms showed mortar fragments distributed in snowflurry manner over the chin, especially on the right side, and along the left side of the neck and paravertebral region. There was a comminuted fracture through the right side of the mandible which extended through the middle of the jaw at the point where the central incisor was removed (Fig. 7, *B*). The fracture extended posteriorly, and a portion of the bone was separated from the main body of the mandible. The base of the coronoid process on the right side was fractured; but in good alignment.

TREATMENT.—More than 200 maggots were removed in the first attempt. A dressing of 15 per cent chloroform in oil was used in the cavities and the remaining maggots were removed the following day. The wounds were then dressed daily with a chlorine-liberating solution.

Interdental wires (Stout method) were applied to the maxillary and mandibular teeth on both sides. Three sequestra were removed from the mandible at the symphysis.

The mandibular left central incisor and right lateral incisor and cuspid teeth were removed. A cast silver splint was applied and wired to the mandibular teeth (Fig. 7, *C*).

NOTE.—Osteomyelitis was present in the mandible on admission. After this subsided, roentgenograms disclosed considerable loss of bone substance at the symphysis and to the right into the body of the mandible (Fig. 7, *D*). A cast silver splint was applied to the mandibular teeth which was to remain in place until a bone graft was performed. Plastic repair was also planned.

■ *Case 6*

A soldier, aged 23, was injured by rifle bullet on July 26, 1944. He was given first aid in a forward medical installation and immediately evacuated by air to a general hospital.

EXAMINATION.—Examination revealed a severe, perforating wound of the face which was infected (Fig. 8, *A*). The missile entered the submental region of the left mandible and emerged at the left side of the chin. There was a complete, compound, comminuted fracture of the mandible, with destruction of the right horizontal ramus, and fracture of the left horizontal ramus. The right mandibular central and lateral incisors, cuspid, bicuspids, first and second molars were missing.

Roentgenograms showed the middle two thirds of the mandible had been destroyed and removed. The destruction extended to the angle of the left mandible and to a point about an inch anterior to

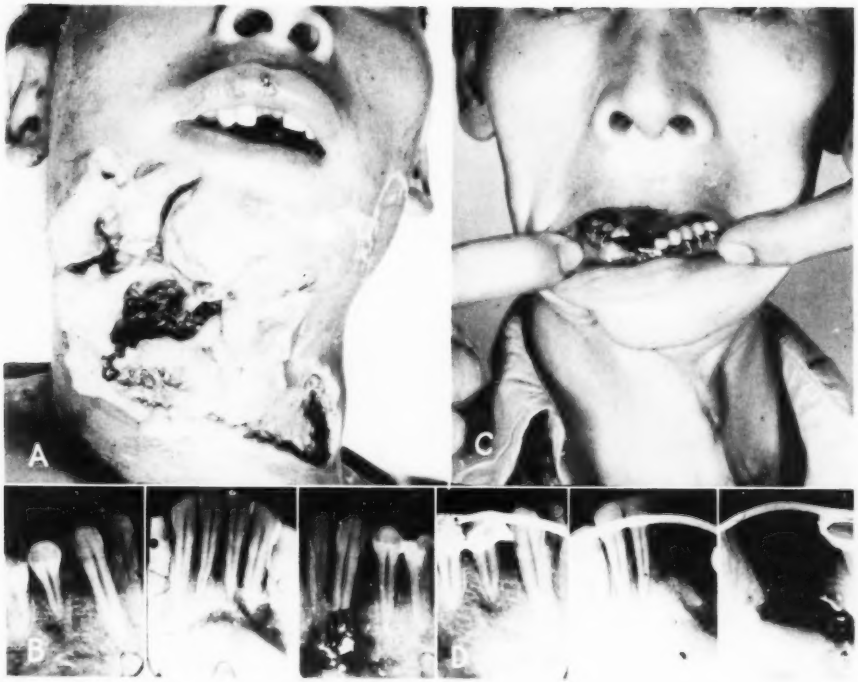

Fig. 7. A: Maggot infested wound. B: Fracture of mandible. C: Cast silver splint in position. D: After reduction of fracture

the angle of the right mandible. Part of the alveolar margin of the mandible was intact. There was a fracture through the base of the right condyloid process.

TREATMENT—A large segment of the mandible (containing the left incisors, cuspid, bicuspids and first molar) was free except for its buccal attachment. Since the mucous membrane farthest away from the attachment looked viable, it was decided to try and save the large section. Individual wiring (Ivy method) was used about the maxillary and mandibular teeth on the left side and steel ligature wire was used to pull the teeth into occlusion (Fig. 8, *B*).

The floor of the mouth was gone beginning at the right corner of the lip. Part of the lower lip was gone. It was felt that it would be worthwhile to try and get some continuity of the vermilion border and mucous membrane. The floor of the mouth could not be completely closed anteriorly because of tissue loss, but it was brought together as much as possible by suturing the mucous membrane of the floor of the mouth to the buccal mucous

membranes. The lip was sutured as was the skin of the chin immediately below it. No attempt was made to close the large wound of the chin. Several rubber tube drains were put into the areas beneath the floor of mouth and along each inner side of the mandible. A sulfonamide and petrolatum gauze dressing was applied. A tracheotomy was done. Photographs taken 10 days and 30 days postoperatively are shown in Figure 8, *C* and *D*.

Roentgenograms taken October 5, showed a fragment measuring approximately 15 by 3 mm. on the left side of the

Fig. 8.—A: Gunshot wound of face; body of mandible displaced. B: Remaining fragment of mandible brought into position. C: Ten days after treatment. D: Thirty days after treatment

mandible. Some union was taking place on the left side.

COMMENT—Although it seemed like a hopeless task, the separated fragment of the left mandible was forced back into approximate position and the teeth were brought into occlusion with interdental wiring. Ten weeks later the x-ray department reported that union was taking place. The fragment was firm when the interdental wires were removed. Elastic traction replaced the ligature tie wires. Plastic repair with bone graft to the right side of the mandible was planned.

■ *Comment*

Great progress has been made in the field of oral surgery in the last 25 years. The American Board of Oral Surgery has been created, and the requirements for qualification by this board are similar to those in medicine.

In general hospitals where the sick and wounded of the armed services are cared for, an oral surgeon is assigned who is qualified by precept, practice and training to teach and to carry out the clinical practice of his specialty.—*1342 Dupont Building.*

An allergic reaction to a local anesthetic

■ *Robert G. Kroll, D.D.S., Clifton, N. J.*

The toxic effect of procaine is that of a rapid depressant; other symptoms are drowsiness, a short period of increased respiration followed by depressed respiration, muscular relaxation and, in extreme cases, convulsions. Deaths have occurred which were attributed to respiratory failure.[1]

The toxic effects of epinephrine are manifest more rapidly than those caused by procaine. These reactions are characterized by abdominal tremor, general lassitude, increased heart action, pressure pain in the chest and throbbing in the head. Psychogenic factors can also play a part in these reactions.[2]

Although the literature on toxic effects of local anesthetics and the synergistic vasoconstrictor drugs is voluminous, few accounts are described which could be classified as allergic reactions.

Simon and Adler[4] report a case of facial swelling and localized vesicular eruptions following the use of a 4 per cent procaine-epinephrine solution. Two weeks prior to this incident, a similar solution was

Associate in oral surgery, School of Dental and Oral Surgery, Columbia University, New York City.

1. Roth, George, Pituitary Standardizations. II. Pharmacological Studies With Cocaine and Novocain. *U. S. Hygiene Lab. Bulletin* 109, 1917.

2. Miller, H. C., and Stuart, C. W., Comparative Merits of Vasoconstrictors in Local Anesthetic Solutions: Their Practical Application. *J.A.D.A.* 23:1883 (Oct.) 1936.

3. Miller, H. C. Clinical Reactions to Various Anesthetic Solutions. *J.A.D.A.* 24:515 (April) 1937.

4. Adler, P., and Simon, M., Contribution to the Problem of Allergy to Local Anesthetics. *Oral Surg., Oral Med. & Oral Path.* 2:1029 (Aug.) 1949.

administered for tooth removal which was followed by a slight facial edema. The authors suggested that a cumulative effect caused the allergic manifestation. The patient was subjected to tests with other anesthetic agents, which produced localized reactions. The question may be raised whether the swelling was caused by the incidental trauma or by a chemical reaction.

The allergic reaction to a local anesthetic reported here differs in some respects from other reported cases associated with procaine or epinephrine.

The patient was a 32 year old white woman in good health who required routine dental treatment. Her previous history was essentially negative.

Preparatory to a dental operation upon the upper left first bicuspid, 2 cc. of procaine 2 per cent, Pontocaine 0.15 per cent, and Cobefrin 1:10,000 was infiltrated on the buccal and lingual aspects of the region. After the injection, the patient volunteered that she reacted allergically to large doses of procaine. She stated that in a surgical operation a larger than usual amount of procaine was required to maintain anesthesia, and a severe generalized reaction with itching and swelling resulted. On several occasions since, however, procaine was used for routine dental procedures with only mild recurrence of the ill effects.

In this instance, there was no immediate reaction noted. Forty-five minutes after the injection, while she was still in the office, an urticarial itchy eruption developed over her entire body. Fifteen minutes later she complained of a sense of swelling in her throat and difficulty in breathing.

The urticarial lesions varied in size from a pinhead to areas of a centimeter or more. The pharyngeal tissues appeared to be edematous and inflamed. As symptoms were progressive, 1 cc. of epinephrine 1:1,000 was administered intramuscularly into the right arm. Soon, the throat spasm subsided, and the skin eruptions began to disappear. About 15 minutes later, the patient was considerably relieved. The itching ceased and the eruptions disappeared almost completely in two hours.

■ *Summary*

An allergic reaction to a local anesthetic is reported. The reaction manifested as partial respiratory embarrassment, urticarial eruptions and itching affecting the entire body.

The anesthetic solution consisted of procaine, Pontocaine and Cobefrin. The reaction was promptly relieved by the intramuscular administration of 1 cc. of epinephrine 1:1,000.

It would be difficult to state which drug or combination of drugs was responsible for this reaction. This case emphasizes the advisability of questioning patients regarding former experiences with local anesthetics.—429 *Piaget Avenue.*

A lymphosarcoma with metastasis

■ *Victor H. Frank, D.D.S., and Charles I. Pratt, Jr., B.S., Philadelphia*

Lymphosarcoma is a malignant tumor which may arise from any aggregate of lymphoid tissue, in all probability from the undifferentiated mesenchymal stem cells.[1] It characteristically consists of diffuse masses of round cells of uniform size, resembling either mature lymphocytes or immature lymphoblasts, and showing a few or many mitotic figures, according to the degree of anaplasia. Differentiation may vary, so that two types of lymphosarcoma may be identified. A well differentiated lymphocytic growth, lymphocytoma, shows partially hyalinized collagenous trabeculae derived from proliferated reticulum. In the second type, lymphoblastoma, the cells are larger and show more pleomorphism, including variations in size and shape, multinucleation, and larger irregular reticular cells like those of a reticulum cell sarcoma.[2]

The lymphosarcoma is distinguished by its rapid growth, destruction of any capsule formation, infiltration of soft tissue, multiple origin and frequent recurrence after excision. Metastases are frequently observed in the spleen, liver, kidneys and bones.[3]

■ *Report of Case*

A married white woman, 42 years of age, complained of pain on the left side of the mandible, with numbness of the chin. The first symptom was a slight numbness around the left corner of the mouth in July 1947. About a month later the patient experienced a sudden sharp pain in the left lower jaw. The pain disappeared, but an abscessed left mandibular first molar was extracted.

The patient traveled to Philadelphia in September and while there severe pain recurred in the left lower jaw with numbness of the chin, tenderness of the jaw, and sensitivity of the submaxillary region. At this time the patient was referred to a consulting neurologist, and was advised to enter the hospital for examination and neurological tests. The neurological examination proved the motor function of the fifth cranial nerve intact; but there was a small area of hyperesthesia, hypalgesia and diminution of temperature sensation over the left chin, stopping suddenly at the midline. There did not seem to be any trigger mechanism for the pain, but evidence indicated some lesion involving the mandibular nerve, either compression or infection.

On September 25 and 27 facial roentgenograms were taken (Fig. 1, *A* and *B*). At this time the patient's husband died in Boston, and she was released from the hospital.

In December 1947 severe pain recurred, and, as the patient had returned

1. Anderson, W. A. D., editor, *Synopsis of Pathology*, ed. 2. St. Louis: C. V. Mosby Company, 1946, p. 423.
2. Willis, R. A., *Pathology of Tumours*. St. Louis: C. V. Mosby Company, 1948, p. 768.
3. Thoma, K. H., *Oral Pathology*, ed. 2. St. Louis: C. V. Mosby Company, 1944, p. 1081.

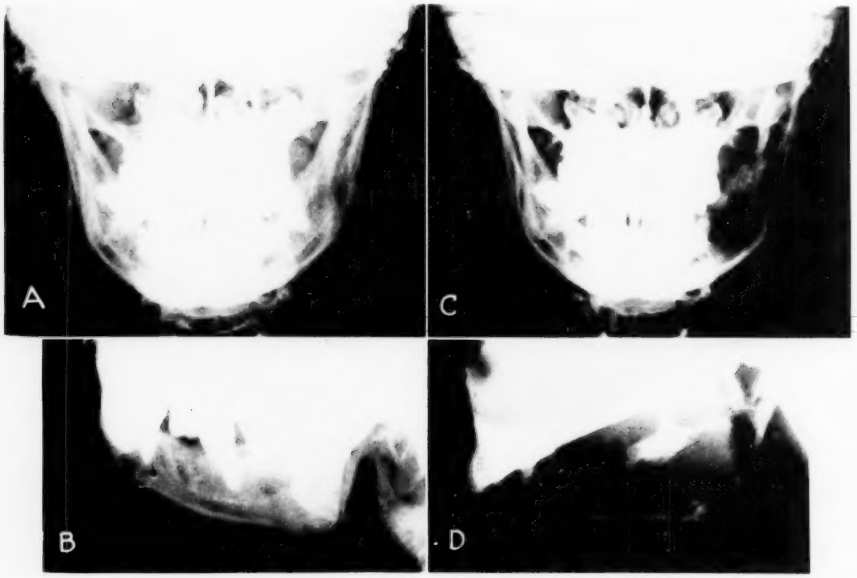

Fig. 1.—A and B: No abnormality of the jaw was evident in September. The slightly rarefied region at the left angle of the mandible was considered normal. Partially healed socket is visible. C and D: Extensive destruction of the left mandible is evident three months later

to Philadelphia, a dentist removed the remaining lower left molar. A few days later, upon examination of the socket, the probe entered for an abnormal distance. The patient was referred to this office, and was immediately hospitalized. Roentgenograms showed extensive destruction of the left mandible (Fig. 1, *C* and *D*). Comparison of the two sets of roentgenograms indicates the rapidity with which this malignant neoplasm can spread and destroy.

The family history gave no evidence of malignancy or tuberculosis. The father died at the age of 40 years, of unknown cause; the mother died at the age of 71, diagnosis, "stroke." There are 6 siblings all living and well, and one son living and well.

Preoperative therapy consisted of 300,000 units of penicillin daily. A specimen for biopsy was removed from the left mandibular molar region December 30, 1947. The histologic examination revealed a dense cellular tissue made up of round cells varying in size from lymphocytes to larger types (Fig. 2). Many mitotic figures were present, and the cells did not represent any normal structure such as a lymph node. It was evidently a malignant tumor of lymphatic origin. The pathologist's diagnosis was reticulum cell sarcoma.

Clinical examination at Oncologic Hospital on January 9, 1948, revealed swelling of the jaw on the left side. The region of the lymph nodes was tender and enlarged.

The mandible, which originally showed a large rarefied region in the ascending ramus and angle on the left side, contained a fracture in the region of the anterior border of the ramus and remained unchanged except for a gradual filling in of bone in the region of the fracture. In October 1948, the mandible at the fracture site appeared fairly normal. The mandible remained radiolucent in the region of the first bicuspid, although there was normal appearance of bone and normal outline in the late stages of the tumor.

Early in 1948 metastasis began in the head of the metacarpel bone of the right thumb, with resultant fracture (Fig. 3). An aspiration biopsy was performed, and grayish tissue highly suggestive of

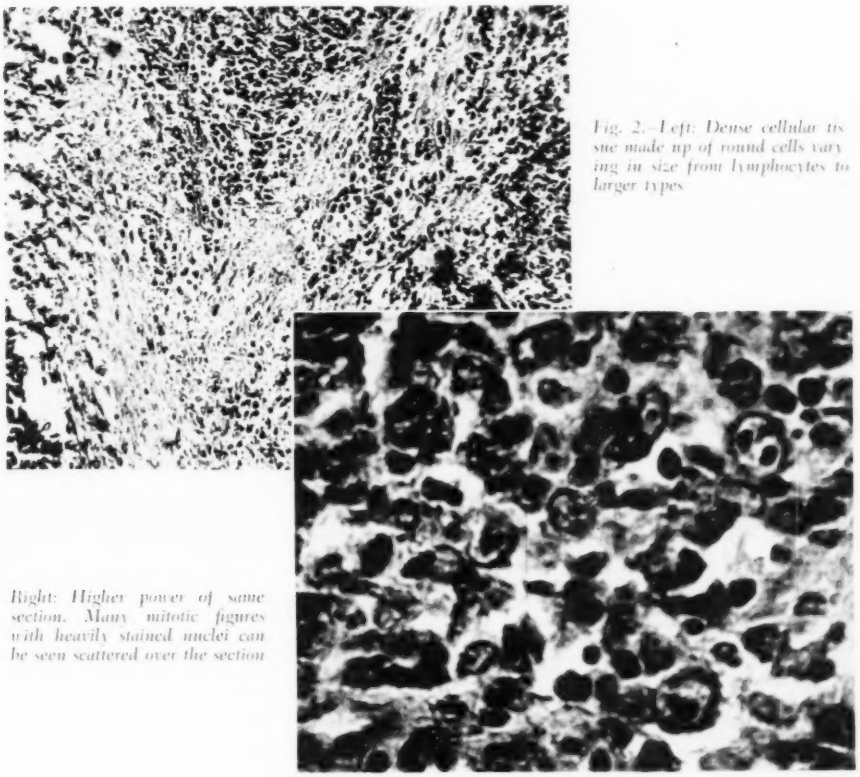

Fig. 2.—Left: Dense cellular tissue made up of round cells varying in size from lymphocytes to larger types.

Right: Higher power of same section. Many mitotic figures with heavily stained nuclei can be seen scattered over the section.

Fig. 3.–Metastasis in the head of the metacarpel bone of the right thumb

malignancy and not resembling bone marrow was obtained. In April 1948 metastasis had progressed to the lesser trochanter of the right femur (Fig. 4), and to the right clavicle. In May 1948 pathologic fracture of the fourth rib and right clavicle occurred as a result of tumor.

There was a fungating mass apparently arising from the third molar region. On January 21, 1948, the gingiva surrounding the visible tumor was infiltrated with 2 per cent procaine. A block of tissue was removed from the lesion, which caused considerable bleeding from the tumor bed. The bed was extremely friable, and bleeding was controlled with difficulty by electrocoagulation and pressure.

An excision biopsy from the lower left gingiva, January 21, 1948, consisted of discoid whitish tissue, rather fine, with a vivid picture of tumor cells. This conforms with the typical microscopic picture of lymphosarcoma. The diagnosis was reticulum cell lymphosarcoma.

The blood picture during the course of this disease was relatively normal. Figure 2 shows the invasion of a capillary with tumor cells. The biopsy from the right thumb showed blood and a few fat globules, with no actual marrow tissue present; but in a few collections of cells an occasional plasma cell was seen (Fig. 5). There was no concentration of these cells, and marrow smears revealed no diagnostic abnormalities. The table shows the comparison of normal blood with this case of lymphosarcoma at onset and at later stages.

Fig. 4.–Right hip joint, showing upper portion of femur with metastasis to the lesser trochanter as indicated by radiolucency

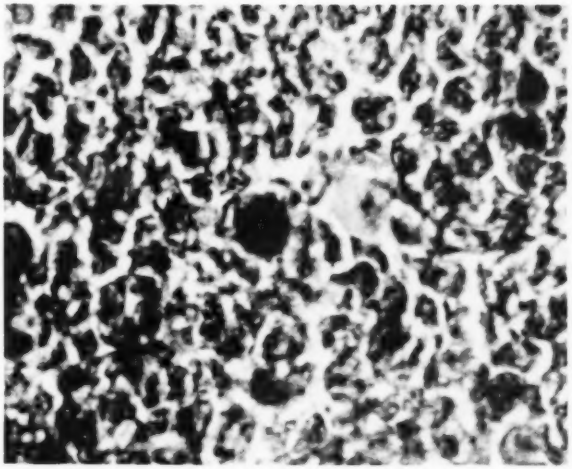

Fig. 5.—Blood taken from the right thumb. Blood cells and a few fat globules are present with an occasional plasma cell, but no concentration of these cells was noted

TREATMENT AND COURSE.—Roentgen therapy was administered throughout the course of this disease, with apparently no success. The course in the hospital was progressively downhill, the tumor manifesting itself by multiple bone involvement, including the parietal bones, pelvis, right shoulder, clavicle, right hand and wrist, left shoulder, and spontaneous fractures of the long bones. The patient died of inanition and bronchial pneumonia on December 18, 1948.

BLOOD PICTURE WITHIN NORMAL LIMITS

Red blood cells	White blood cells	Neutrophils	Lymphocytes	Basophils	Monocytes	Eosinophils
4,500,000	7,000	70%	20%	0.5%	1-2%	1%

BLOOD PICTURE OF PATIENT WITH LYMPHOSARCOMA

Date	Red blood cells	White blood cells	Neutrophils	Lymphocytes	Basophils	Monocytes	Eosinophils
9 25 47	3,760,000	7,900	70%	22%	1.0%	7%	—
12 27 47	4,240,000	4,400	75%	22%	—	2%	1%
9 7 48	3,730,000	2,800	79%	19%	—	—	2%*
12 8 48	2,700,000	5,200	84%	16%	—	—	—
12 18 48	Patient died—macrocytosis normochromia						

*During the course of the disease the eosinophils rose as high as 7 per cent at one time.

Comparison of normal blood picture with blood picture of a patient with lymphosarcoma, at onset and at later stages

AUTOPSY—The autopsy revealed generalized sarcomatosis, particularly in the kidney, heart, lymph nodes, adrenals, lungs and muscle. The major course of metastasis appeared to be by the lymph channels. Tumor cells were prominent in the lymph nodes.

■ *Comment*

The vivid picture of metastasis and destruction caused by this tumor illustrates the need for increased research, early diagnosis and prevention of cancer.

In reviewing this case impartially, the roentgenograms taken of the left mandibular region were re-examined by the radiologist of Graduate Hospital, who stated, "After looking at the December 1947 x-ray films, I could see beginning irregularity in bone formation of the left mandibular area on the September films, however, taken by themselves, it is practically impossible to detect any disturbance."

We believe there is no case on record, with roentgenograms taken three months apart, showing first normal conditions (to a radiologist's eyes) and then such complete destruction. This emphasizes the need for repeated roentgenographic examination and particular attention to any complaint of paresthesia.—*1800 Pine Street.*

■ A New Finger File

The files now in use have handles and long filing surfaces. When used in the mouth the handle necessitates a push and pull stroke of the forearm, and occasionally rubs against the commissure of the mouth causing a brush burn. In attempting to overcome these two drawbacks, I designed several files with finger grips riveted to them.

The present file is an adaptation of these ideas (see illustration). It has two finger grips about three-fourths of an inch apart which encircle the finger; these give stability preventing lateral movement when in use. The finger grips are open so that they can be adjusted to fit the operator's finger. The length of the file is designed to fit the operator's index finger from its tip to just short of the second joint. The blade is narrow, about one-fourth inch, allowing the operator to determine with the outer surfaces of the index finger if the instrument is over the exact part to be filed. The forearm stroke necessary with the old-fashioned handle file can thus be replaced with a more accurate movement of the index finger.

This file originally was designed to remove small pointed spicules or small surfaces of excess bone. However, it has the efficiency of a larger file (plus the new features) and can be used anywhere the operator previously used a larger file.

I find that this instrument in use has these advantages over files with handles: (1) it is more easily operated; (2) it is more accurately controlled; (3) it can be used in more positions because of its size; (4) it is more protective to the patient's lips and tissues.—*Victor H. Frank.*

Alveoloplasty

■ *J. Roy Bourgoyne, D.D.S., and James H. Quinn, D.D.S., Memphis, Tenn.*

Far too often the importance of alveoloplasty is ignored when preparing a mouth for artificial dentures. A ridge with the desirable contours is appreciated by the prosthodontist, and results in the ultimate satisfaction of the patient.

It is common practice to attempt the construction of dentures on ill contoured ridges because of fear that the patient would refuse all work if alveoloplasty must be performed. Yet seldom does it enter the mind of the dentist that this same patient, if not satisfied, can and may do him harm on completion of a poorly constructed appliance.

The term alveoloplasty should be interpreted as meaning the excision of a part of the alveolar process, or as the correction of the contours of the ridge by surgically removing the bone which makes up the deformity or malformation. The operation is usually performed to facilitate retention of artificial dentures. Such operations are not new. Suddarth[1] says that W. G. Beers of Montreal, Canada, reported in 1876 that he had practiced ridge contouring as a common method of preparing the mouth for artificial dentures. However, Suddarth relates that it was in 1905 that William Shearer of Nebraska performed this operation, described it, and recommended its use. However, when the operation was first begun, its advocators were severely criticized.

The irregularities of the ridge may be congenital or acquired. They are frequently associated with trauma during the removal of teeth, failure to complete the postextraction contouring of the ridge properly, exostoses, infections and old fractures.

Templeton[2] states that surgical correction is indicated in areas characterized by large tuberosities that are undercut on the lingual or buccal; prominent anterior ridges, either maxillary or mandibular; enlarged buccal plates; torus mandibularis or palatinus and prominent mylohyoid ridges.

Thorough roentgenographic studies should be made before the operation. Often study casts are desirable. Unerupted teeth, root tips, infections, bony growths and foreign bodies revealed in roentgenograms can be corrected in the course of the alveoloplasty.

Though it is impossible to operate under totally aseptic conditions, every precaution must be taken to minimize the possibility of infection.

This operation may be performed as part of the extraction operation, or it may be performed at a later date. The health of the patient, the presence or absence of

Associate professor of Oral Medicine and Surgery, and chief of Division of Oral Surgery, University of Tennessee, College of Dentistry, Memphis, Tenn.

Instructor of Oral Medicine and Surgery, University of Tennessee, College of Dentistry, Memphis, Tenn.

1. Suddarth, C. S., Surgical Preparation of the Mouth for the Reception of Artificial Dentures. *J.A.D.A.* 23:468 (March) 1936.

2. Templeton, L. C., Surgical Preparation of the Mouth for Artificial Restorations. *Am. J. Orthodont. & Oral Surg.* 31:511 (Aug.) 1945.

infection and the extent of bone removal are determining factors in deciding the amount of surgery to be performed at one sitting.

If full upper and lower dentures are to be prepared, one arch may be done at each sitting. If the dentures are to be placed immediately, the posterior teeth should be removed, the ridges prepared and permitted to heal. Later the anterior teeth are removed, the ridges prepared and the dentures inserted at one sitting. Extraction of upper and lower teeth, preparation of ridges and immediate insertion of dentures is usually too much surgery for the patient.

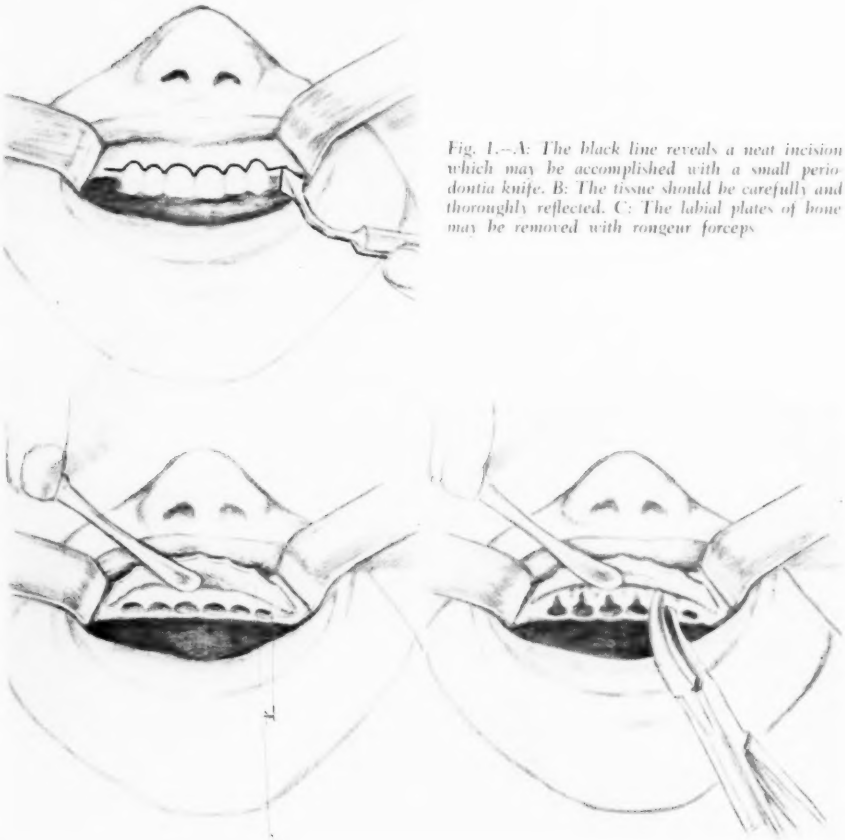

Fig. 1.—A: The black line reveals a neat incision which may be accomplished with a small periodontia knife. B: The tissue should be carefully and thoroughly reflected. C: The labial plates of bone may be removed with rongeur forceps.

Pike[3] suggests that cases which involve a great deal of gingival infection may be handled by extracting the teeth in a suitable number of sittings and then permitting the tissues to heal for a period of three weeks. At the end of this period the ridges are exposed and necessary corrections made. He also suggests that it is advisable in conventional cases to extract the posterior teeth first as if immediate dentures were to be made, giving them time to heal before dentures are placed. Then the anterior teeth are extracted, ridges prepared and impressions taken immediately. If the operator wishes, he may wait one week to permit healing before taking impressions.

■ *In the Presence of Teeth*

There is no fixed surgical technic in the preparation of ridges for reception of artificial dentures. The teeth may be removed and the flap turned or vice versa. The operator may have a preference or there may be some indications relative to the case at hand. If all of the teeth are to be removed in the maxillary arch, an incision may be made from the distal of the last tooth and carried over the center of the ridge including the tuberosity. The other side is incised in the same manner (Fig. 1, *A*). These incisions may include the interproximal tissues of the posterior teeth. It is important that the scalpel or knife be sharp and that the cut be made entirely to the bone. This may mean cutting through the same incision several times with applied force. There may be a tendency for considerable bleeding requiring gauze pressure and aspiration to control the hemorrhage and remove the blood. Starting on either side the flap is loosened and turned away from the bone. A periosteal elevator is used and care is taken to separate the periosteum from the bone and turn the flap with a minimum amount of trauma. The teeth often serve as fulcrums in separating this tissue from the bone. The extent or point to which the tissue should be separated on the buccal and labial will depend on the amount of bone that is to be removed. The operator should have good access and be able to see the field in which he works. A small amount of detachment is all that is necessary on the lingual because bone removal there usually consists of a smoothing process only.

With the flap turned, the operator is ready to perform the extractions. In some cases it may be advisable to remove heavy bone over the roots of the teeth to make the extractions easier and prevent removal of more bone than is necessary. Following removal of the teeth, all pathologic portions should be excised.

The tissue should be thoroughly reflected to give a full view of the operating region (Fig. 1, *B*). Rongeur forceps, chisels, mallets, files and burs may be used to remove all undercuts and attain a smooth junction of the trimmed and untrimmed bone. The chisel and mallet are useful in removing heavy buccal bone while the rongeur forceps may be useful in removing labial and buccal plates to the desired level (Fig. 1, *C*). The sharp margin of the sockets may be removed with one edge of the rongeur forceps (Fig. 2, *B*). The bone file is adequate for smoothing the trimmed areas and remov-

3. Pike, G. C.: The Surgical Preparation of Jaw Ridges, *Illinois D. J.* 9:286 (Aug.) 1940.

ing sharp spines (Fig. 2, *B*). It is important to conserve as much bone as possible.

A thorough examination is made of the field for any bone spicules that might serve as foreign bodies. This is done best by cleaning and examining each socket as well as the soft tissue flap. The flap is brought into position and smoothness and contour of the ridge are checked by digital examination.

Before sutures are placed the tissues are brought together and checked for trimming. The amount of soft tissue to be removed will be in proportion to the bone removed. The important thing is to have the tissues fit together without too much flabbiness and at the same time be loose enough to prevent stretching or displacement of muscle attachments. The sockets need not be completely covered, especially in the molar region. Either interrupted or continuous catgut sutures are placed with curved cutting needles. They should be placed over bone, not sockets, and should not be tight because tight sutures stretch the tissues and are more likely to tear. (See Figure 2, *C*.)

■ *The Edentulous Mouth*

For the preparation of an edentulous maxillary ridge, an incision is made from tuberosity to tuberosity along the crest of the ridge. The tissues are elevated on the buccal and labial. On the palatal side only a slight elevation is necessary. The excess bone is removed by the use of chisels, mallets, rongeurs, surgical burs or files. When finished the bone should be smooth and rounded with no undercuts present. The field is cleaned, soft tissues trimmed if necessary and sutures placed. The incision and flap should be sufficient to enable the operator to work without visual or mechanical interference.

In the lower arch it is sometimes necessary to correct prominent anterior ridges and mylohyoid ridges. The operator should be cautious in handling the soft tissues in the mylohyoid region because of the frequency of swelling and infection in that region.

■ *Technics*

Kazanjian[4] describes several operations to restore contour of deformed ridges. If the maxilla is more prominent than the mandible, it will be necessary to remove bone from the upper anterior region. This will reduce the height of the labiogingival fold. In treating such a case the labial flap is separated up to the nasal spine and canine fossa. After the bone is removed, the soft tissues are sutured loosely and a small flexible rubber tube is placed in the fold, elevating it to a higher level. The tube is held in place by running the sutures around it and through the lip. The outside part of the suture is tied over gauze to prevent tearing the skin. A similar operation may be performed on lower jaws where there has been excessive loss of bone.

There are several schools of thought on mouth preparation for the reception of dentures, but it is apparent that most general practitioners, exodontists and prosthodontists are in favor of some correction.

We recommend that the ridges be properly prepared in every case of multiple extraction even though it may mean

4. Kazanjian, V. H.: The Surgical Treatment of Abnormalities of the Edentulous Alveolar Processes and the Palate. *Am. J. Orthodont. & Oral Surg.* **26**:263 (March) 1940.

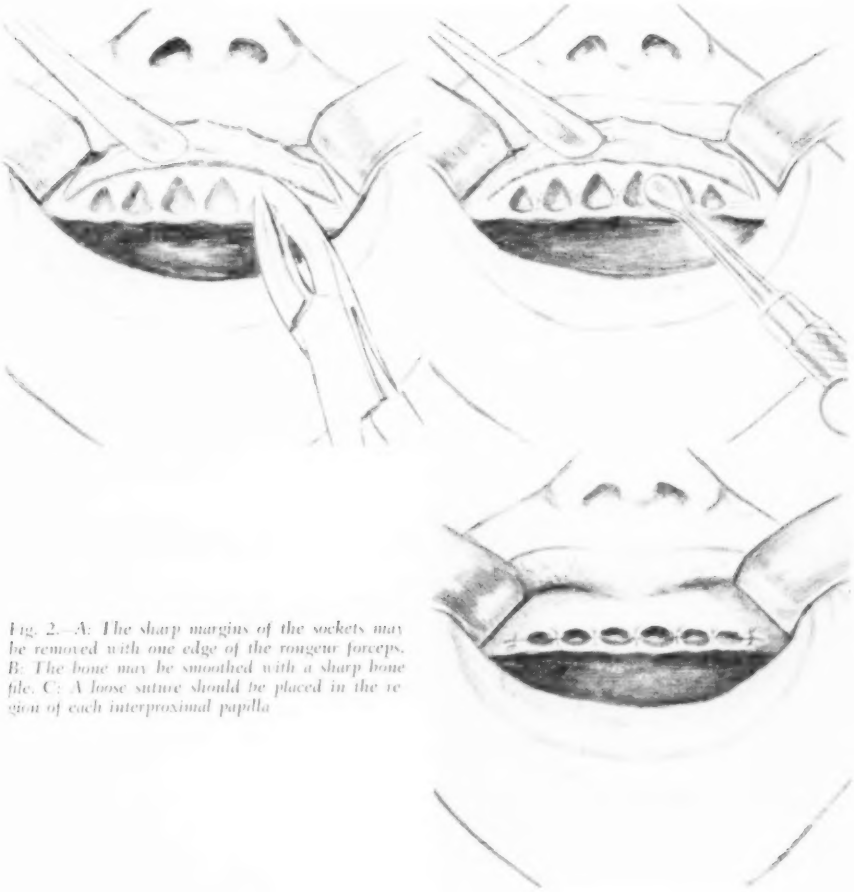

Fig. 2.—A: The sharp margins of the sockets may be removed with one edge of the rongeur forceps. B: The bone may be smoothed with a sharp bone file. C: A loose suture should be placed in the region of each interproximal papilla

removal of sharp or uneven edges. Cogswell[5] brought forth many favorable comments when he advocated the idea that the preparation of the mouth for dentures should begin with the extraction of the first tooth.

Pendleton[6] points out that there are important mechanical problems of denture service that are partially or completely solved by alveoloplasty. One of these is the providing of adequate space for correct positioning of the teeth from an esthetic and functional standpoint. Also

5. Cogswell, W. W.: Surgical Preparation and Conservation of the Dental Ridge for Dentures. *J.A.D.A.* 19:1574 (Sept.) 1932.

6. Pendleton, E. C.: Preoperative Treatment in Full Denture Service. *Illinois D. J.* 17:223 (June) 1948.

there will be a reduction of forces upon the supporting tissues.

Hooton[7] reported a case that required radical removal of bone. A girl 16½ years old had gone without dental care for several years because her parents thought her teeth should be ignored until she was old enough to have them extracted. She had extreme distoclusion with exceedingly prominent protruding maxillary incisors. Her teeth were extracted, ridges contoured and dentures placed. The correction was so successful that the psychological effects on the patient were outstanding.

Little has been done from an experimental standpoint on the various phases of the alveoloplasty. Svoboda[8] reports that dogs have been used for some experiments and materials from the autopsy table have been studied, but these have not been properly tied in with the changes in living human tissues. He used two clinical cases for his study, an edentulous white male 58 years old and an edentulous white female 38 years old. The operations were performed in the usual manner. Sections were made at intervals from 2 to 53 days. The sections involved both bone and overlying soft tissues. Clinical observations were made along with the biopsies. He concluded that there are two stages of the healing process of alveolar bone, the reactive stage and the transformation stage. The first extends over a period of about 21 days and the latter continues throughout the life of the patient. The operator may safely place dentures when the transformation stage has been reached. Some of his other observations were:

1. Entrance of saliva will delay clot formation and thus may delay healing.

2. Pain caused by the elevation of flaps is similar to that experienced with a dry socket and can be controlled in a similar manner.

3. Entrance into the maxillary sinus does not influence the final outcome.

4. The position of the buccal fold is altered, probably because of constriction of tissues.

5. Partial alveoloplasty is as satisfactory as complete alveoloplasty as far as healing and ridge contour are concerned.

■ *Summary*

1. Alveoloplasty may be defined as the correcting of the contours of the ridge by surgically removing the bone which makes up the malformation.

2. Surgical correction of mouths for dentures has been practiced for almost a century in this country.

3. Surgical technics vary with the operators, but are essentially the same.

4. While there are some opponents to the alveoloplasty, it is generally considered good practice.

5. Conservative but effective treatment is advised, but there are cases in which radical or extensive treatment is indicated.

6. In the healing process of alveolar bone there are two stages, the reactive stage and the transformation stage. The first lasts about three weeks and the second continues throughout the life of the patient.

7. Hooton, O. G. Extensive Alveolectomy Accompanying Complete Removal of Teeth and Subsequent Construction of Artificial Dentures. *New Zealand D. J.* 42:131 (July) 1946.

8. Svoboda, J. F. Clinical Study of Repair of Bone After Alveolectomy. *J.O.S.* 5:91 (April) 1947.

Immediate prosthesis following radical resection in advanced primary malignant neoplasm of the mandible

■ S. *Gordon Castigliano, M.D., and P. Philip Gross, D.D.S., Philadelphia*

The outcome in the management of certain primary malignant neoplasms of the mandible is dependent upon the stage at which treatment is instituted, the histologic character of the lesion and the aggressiveness of the surgical procedure.

Irradiation therapy is generally believed to be of little value in the treatment of advanced primary malignant lesions involving the mandible, except as a palliative gesture. At the American Oncologic Hospital, intensive irradiation therapy has been used preoperatively in the treatment of certain primary bone lesions for the past ten years, with the idea of attempting complete tumor devitalization. Occasionally, this technic is applicable to lesions involving the mandible. Complete devitalization of the tumor is rarely possible. However, in a reasonable percentage of cases, the effect of profound irradiation therapy on the tumor can be demonstrated.

It is likely that such irradiation serves a threefold purpose:

1. It may decrease the incidence of preoperative showers of tumor emboli, thereby decreasing the possibility of metastases.

2. It may decrease the incidence of successful tumor dissemination during the operative procedure. The profound irradiation effect on the tumor renders the residual cells, both qualitatively and quantitatively, less likely to set up foci of metastasis.

3. It may provide a short period of observation during which metastasis, if present in subclinical form, may positively declare itself, thereby obviating useless radical procedures.

The case reported here demonstrates the successful use of irradiation before radical resection of an advanced primary malignant neoplasm of the mandible and immediate prosthetic repair of the defect.

■ *Report of Case*

A 38 year old white man was first referred in April 1948, with a history of swelling involving the left side of the mandible. Because of swelling and pain in the region of the mandibular left cuspid tooth, the patient had visited his dentist in November 1947. At that time the cuspid was removed, but the pain did not subside. Shortly thereafter, the gingival tissue became "swollen," and two weeks later the patient visited a second dentist,

Chief of Head and Neck Service, American Oncologic Hospital; professor of Oncology, Dental School, Temple University, Philadelphia.

Chief of Oral Surgery, American Oncologic Hospital; associate in Oral Surgery, Graduate School of Medicine, University of Pennsylvania, Philadelphia.

who incised the area, but there was no drainage.

Four months after onset of the symptoms, because of pain and persistent, increasing swelling, the patient consulted a third dentist. The remaining mandibular anterior teeth were removed and the area of most prominent swelling was again incised, without drainage. Because of the history and unusual conditions noted, a biopsy specimen was taken from the piled up and indurated tissue springing from the socket of the previously removed mandibular left cuspid tooth. A diagnosis of probable malignant tumor was made from the biopsy.

The past medical history was essentially irrelevant to the present condition. There was no family history of cancer.

EXAMINATION—In April 1948, when the patient was first examined in this office, there were no pertinent or significant abnormal physical conditions other than the local lesion.

The temperature, pulse, respiration and blood pressure were within normal limits.

The maxilla and mandible were edentulous. The patient was able to open and close his mouth without difficulty. There was an expanding mass on the lingual surface of the mandible which extended from a point just left of the symphysis to the left cuspid region. This mass bulged the lingual plate about 1.5 cm. The labiobuccal plate was also expanded from the symphysis to the left bicuspid region. The alveolar process was less than 0.5 cm. above its normal level. There was no feeling of egg-shell crackle upon palpation of the mass. On the left outer surface of the alveolar process of the mandible there was an ulceration with fungating edges which extended from the region of the left lateral incisor to the region of the left first molar. This apparent neoplastic ulceration did not infiltrate into the sulcus. It represented an obvious neoplastic breakthrough or eruption of the buccal plate.

Examination of the cervical regions revealed no evidence of malignant lymphadenopathy.

ROENTGENOGRAPHIC EXAMINATION—In the occlusal roentgenograms, cortical expansion of the osseous structure was obvious. Fine radiating spicules perpendicular to the surface of the involved bone were observed.

These radiating forms of periosteal ossification were suggestive of subperiosteal neoplastic infiltration. A roentgen survey included studies of the long bones, skull and chest. No evidence of osseous or pulmonary metastasis was noted.

BIOPSY—Although a diagnosis of probable malignant tumor was made from the biopsy specimen obtained from the outside institution, the slides were considered inadequate for unequivocal diagnosis. Because of this a second biopsy was performed, and a diagnosis of anaplastic malignant neoplasm of the mandible was made.

TREATMENT—External irradiation therapy was delivered to a carefully controlled area, 11 by 6 cm. A special lead mask was constructed to protect normal structures. A total of 3,500 r (in air) was delivered to this area, using the following factors: 200 kilovolts; 50 cm. target skin

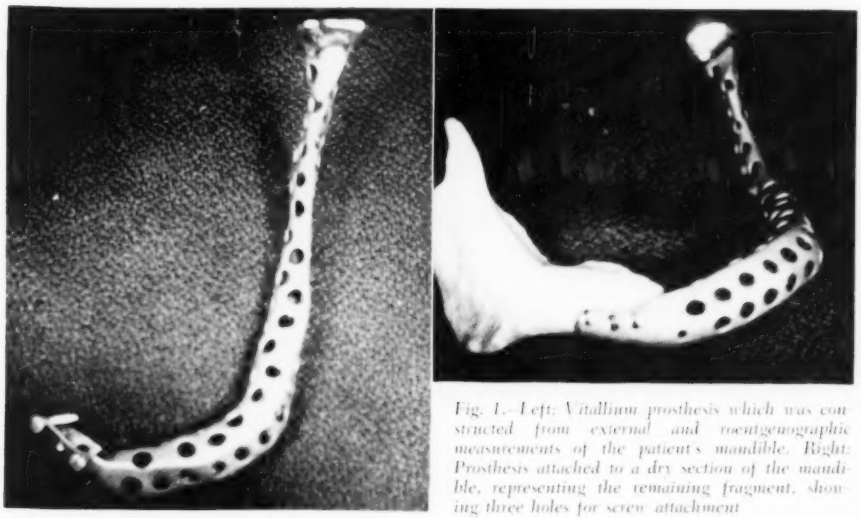

Fig. 1.—Left: Vitallium prosthesis which was constructed from external and roentgenographic measurements of the patient's mandible. Right: Prosthesis attached to a dry section of the mandible, representing the remaining fragment, showing three holes for screw attachment

distance; 1 mm. copper plus 1 mm. aluminum filtration; 300 r per dose from April 26 to June 9, 1948.

Peroral irradiation therapy was delivered to a carefully controlled area, using a special lead cone with a 3.5 by 4.8 cm. opening on a 5 cm. master cone attached to a Castigliano periscope. A total of 8,100 r (in air) was delivered, using the following factors: 200 kilovolts; 40 cm. target subject distance; 0.5 mm. copper plus 1 mm. aluminum filtration; 300 r per dose from April 27 to July 1.

The total dose was 11,600 roentgens at 2 cm. depth. A severe irradiation mucositis and moderate epidermitis developed during therapy, but had completely subsided by August 6. Complete healing of the break-through of the buccal plate and of the site of the original lesion was noted. Some expansion of the lingual and buccal plates was still evident.

PREOPERATIVE PREPARATION—Repeat roentgenographs of the chest, long bones and skull revealed no evidence of metastasis. The neck was negative for metastatic nodes. In view of these unexpected observations, it was concluded that the patient should be given the benefit of radical surgery in order to give him the best possible chance for long term survival.

A Vitallium prosthesis was constructed from external and roentgenographic measurements of the patient's mandible (Fig. 1).

A plaster head cap was constructed on a felt base, and on each side of the head cap were inserted Roger-Anderson screw fixation and bar attachments. These were firmly embedded in the plaster. The bar from the right side of the mandible was later attached to this cap to maintain rigid support of the mandibular fragment and the prosthesis.

On November 24, 1948, under local anesthesia, three Bigelow screws were inserted in the body of the mandible anterior to the angle and above the mandibular canal. A Bigelow bar was temporarily inserted to keep the screws in position for the next stage of the procedure (Fig. 2).

ANESTHESIA—The operative procedure was accomplished under local anesthesia as follows: bilateral injection of 4 per cent procaine into the third division of the trigeminal nerve at the foramen ovale; nerve block of the second and third cervical nerves with 2 per cent procaine and infiltration of 1 per cent procaine into the soft tissues of the neck.

OPERATION—The entire operation was performed intraorally. Sutures were placed in the tip and left mid tongue for traction. An incision was made, starting in the retromolar region of the right (contralateral) side along the crest of the ridge to the right cuspid region. The incision at this point was directed downward past the sulcus and in the buccal surface, then continued parallel to and about 1.5 cm. below the crest of the ridge to the left retromolar region. At this point the incision was carried up to the crest of the ridge and extended to the tip of the coronoid process. The same procedure was performed on the lingual surface with the incision deep in the floor of the mouth. The incision everywhere was kept wide of the involved region.

Fig. 2.—Plaster head cap over a felt base with Roger-Anderson screws with lugs and bar attachments. Three Bigelow screws were inserted in the right side of the mandible. A Bigelow bar was placed into the screws for immobilization. A cocoon dressing was placed around the screws

After completion of the incision, hemostasis was established. A curved hemostat was introduced under the mandible in the right cuspid region. A Gigli's saw was brought under the mandible, cutting the mandible at that site. The mucoperiosteum beyond the involved portion was retracted and the mandibular muscle attachments were cut wide of their points of insertion in the section of the mandible to be removed. The coronoid process was cut with a bone-cutting forceps and the left side of the mandible was rocked out of the glenoid fossa. The fact that the incision was made wide of the involved portion of the mandible permitted the gingival tissues, the mucoperiosteum and the muscles attached to the irradiated region to remain intact over the bone. The entire mass was then removed with the resected mandible (Fig. 3, left).

Cutting the coronoid process is important. The rocking, twisting and complete turning of the mandible, which is so

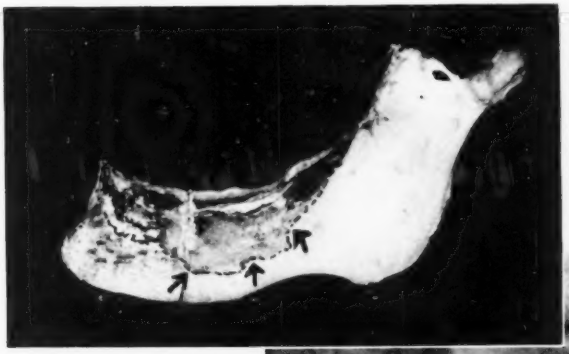

Fig. 3.—Left: Resected mandible. Dotted lines indicate limit of attached soft tissues. Arrows point to edge of buccal tissue removed with mandible

Right: Prosthesis in position. Muscles of the floor of the mouth were sutured to the crib of the prosthesis, with sutures tied on the lingual surface

often necessary to bring about the separation of its attachments, is a most traumatizing procedure with the coronoid process left intact. With it cut, the plowing action of the coronoid process is eliminated and the mandible can be twisted on itself without fear of trauma. This technic, developed by surgeons many years ago, but little heard of, was essential for the successful performance of the operation. After removal of the mandible the coronoid process is easily removed. However, it is doubtful that its removal is necessary.

The Vitallium prosthesis was immediately inserted in the glenoid fossa and fixed to the mesial aspect of the right remaining fragment by three small Vitallium screws. The muscles of the floor of the mouth, including the genioglossus and the myiohyoid, were sutured to the crib of the prosthesis, with sutures tied on the lingual surface (Fig. 3, right). The

lingual and buccal tissues were then coapted.

This procedure was accomplished with the dual purpose of giving function to the muscles and providing elimination of the dead space.

For fixation of the right mandibular fragment to which the prosthesis was attached, a 30 inch Bigelow bar was inserted in the slots of the preoperatively inserted Bigelow screws; one end extended upward and was attached to the head cap anteriorly. The other end was bent on itself outward and was attached to the right

Fig. 4.—A and B: Fixation of right fragment of mandible from Bigelow screws to the head cap by means of a Bigelow bar bent on itself and brought over the vertex of the skull and attached to the opposite side. C: Ten days postoperatively. Note position of condyle and attachment of the prosthesis to the right mandibular fragment. External Bigelow screws are in position

Fig. 5.—Left: Eighteen months after resection of the mandible and prosthetic repair, there is little apparent facial deformity. Right: Good callus formation and stabilization at the site of junction of the prosthesis and mandibular fragment

side of the head cap. The bar was then bent over the vertex of the head and attached to the opposite side. This technic was employed to prevent vertical and lateral motion of the fragment (Fig. 4, *A* and *B*). Immobilization was continued for a period of ten weeks. The patient was hospitalized for two weeks after the operation.

MEDICATION—The following medication was used preoperatively and postoperatively until discharge:

Penicillin, 900,000 units daily for two days prior to the insertion of the Bigelow screws and continuing after discharge from the hospital.

Streptomycin, 0.25 Gm. every 6 hours, one day prior to resection and continuing for 11 days postoperatively.

Sulfadiazine, 15 grains every 4 hours, second day postoperatively and continuing for 9 days.

Parenteral vitamin therapy, ascorbic acid, 600 mg. daily for 11 days postoperatively, then 200 mg. daily, orally, for remainder of hospital stay; vitamin B complex for 14 days.

After discharge, the patient was given repository penicillin, 4 cc. every 3 to 4 days, and supplementary vitamins (A, B, and C), by mouth, for two and a half months.

Roentgenographic studies were made 10 days postoperatively to show general configuration (Fig. 4, *C*).

The final pathologic diagnosis was anaplastic malignant neoplasm of the mandible.

FOLLOW UP—Follow up studies were made March 27, 1950, 18 months postoperatively, at which time there was no evidence of recurrence or development of metastatic disease. There has been good callus formation and stabilization at the site of junction of the prosthesis to the right mandibular fragment. Mobility of the mandible and function are adequate. There is little facial deformity (Fig. 5, left). A posteroanterior roentgenogram is shown in Figure 5, right.

■ *Summary and Discussion*

A case of advanced primary malignant neoplasm of the mandible without evidence of metastasis was treated by intensive preoperative irradiation therapy (11,600 r), followed by radical resection of the mandible by the oral route. An immediate prosthetic replacement was successfully accomplished.

This paper presents an approach to the management of certain malignant neoplasms of bone. Several features offer a new approach to an old problem. The use of intensive preoperative irradiation therapy, carefully planned and executed with precision, is shown to be compatible with a radical surgical procedure; immediate massive prosthetic replacement is compatible with intensive irradiation therapy, providing the surgical procedure is not too long delayed.

The recognition of the compatibility of intensive irradiation therapy and radical surgery brings within the scope of radical but nonmutilating surgery at least a few cases now considered categorically inoperable. This conversion of an inoperable case to the status of operability, although seldom possible, is worthy of more frequent trial. Although many primary malignant neoplasms are not radiosensitive, the use of such intensive irradiation therapy may exert a highly desirable effect by decreasing the preoperative showers of emboli, by decreasing the incidence of tumor dissemination during the operative procedure and by providing a period of observation for subclinical metastasis to become evident.

Even in cases where the immediate result of irradiation therapy may appear startlingly good, it is likely that complete tumor devitalization has not been effected. The dormant embers at some later date all too often are fanned into activity by factors not yet known. Therefore, we favor resection of the mandible in all primary malignant intramandibular neoplasms, regardless of apparent radiosensitivity.

The most recent roentgenographic and laboratory studies of the case presented (18 months postoperatively) show no evidence of recurrence or development of metastatic disease. There has been good callus formation and stabilization at the site of the junction of the prosthesis to the right mandibular fragment. Mobility of the mandible and function of the condyle of the prosthesis are adequate. The deformity of the facial features is insufficient to be classed as a cosmetic liability.

The role of nuclear physics in medicine and dentistry

■ *D. H. Copp, M.D., Berkeley, Calif.*

The twentieth century has seen a tremendous development in the field of nuclear science, which began with the discovery of radioactivity by Becquerel in 1896 and reached a climax with the development of the uranium pile and the atomic bomb in 1945. Medical science has been quick to apply these discoveries. Three years after radium was first isolated by the Curies in 1898, it was being used to treat skin disease and cancer. However, the chief contribution came with the artificial production of radioactive isotopes of the common elements. This was first accomplished by Curie and Joliot in 1934, using a radium-beryllium source to produce radioactive phosphorus. The development of the atom-smashing cyclotron by E. O. Lawrence in 1936, and the chain reaction pile in 1942 greatly increased the number and quantity of these radioactive isotopes available for medical use.

These isotopes are atoms with the same nuclear charge and chemical properties as the normal element, but with an unstable nucleus, which disintegrates with the emission of radiations. Since these radiations may be easily measured with a Geiger counter or other similar device, it is possible to detect the presence of the radioactive isotope wherever it may go in the body. Such "tagged" elements have proved invaluable in studying the function of the body in health and disease.

While chiefly of use as radioactive tracers in fundamental medical research, radioactive isotopes are being used increasingly in the diagnosis and treatment of certain diseases. In addition, the radiation hazards involved, and the threat of the atomic bomb have focused attention on the new problems of radiation medicine.

■ *Radioactive Isotopes*

The fundamental unit of radioactivity is the curie, which is defined as the activity of radon gas in equilibrium with 1 gram of radium. A smaller unit, the millicurie (0.001 curie) is more commonly used, and this is defined as the amount of radioactive isotope in which 3.7×10^7 disintegrations occur per second.

There are several factors to be considered in selecting an isotope, particularly for clinical work. The isotopes available from the Isotopes Branch of the United States Atomic Energy Commission are listed in their catalog. Total shipments exceed 5,000. Recently, the commission has agreed to supply isotopes for use in cancer research and treatment at no cost except for handling charges. A prime consideration in choice of isotope is the half-life, or time during which half of

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Division of Physiology, University of California Medical School, Berkeley, California. Now professor of physiology, University of British Columbia, Vancouver, Canada.

Properties of radioactive isotopes important in medicine and dentistry

Element	Isotope	Half-life	Radiation	Cost	Important uses
Phosphorus	P^{32}	14.3 days	beta, 1.69 mev.	$1.10 per mc.	Metabolic studies; treatment of chronic leukemia, polycythemia and skin cancer; localization of breast and brain tumors; tagging red cells, measurement of red cell volume
Iodine	I^{131}	8 days	beta, 0.6 mev. gamma, 0.367 mev. 0.080 mev.	$1.70 per mc.	Metabolism of thyroid; diagnosis of thyroid disease; treatment of hyperthyroidism and a few cases of thyroid cancer; tumor localization with tagged diiodofluorescein; tagged iodinated plasma
Sodium	Na^{24}	14.8 hours	beta, 1.4 mev. gamma, 1.4 mev. 2.8 mev.	$12 per 20 mc.	Absorption studies; extracellular fluid measurement, circulation rate; peripheral circulation efficiency
Iron	Fe^{59}	44 days	beta, 0.26 mev. 0.46 mev. gamma, 1.1, 1.3 mev.	$33 per 1.9 mc.	Iron metabolism; anemia; tagged red cells, blood volume studies and survival of stored blood
	Fe^{55}	4 years	gamma, 0.07 mev.		
Strontium	Sr^{89}	55 days	beta, 1.5 mev.	$1.35 per mc.	Skeletal metabolism; treatment of bone tumors
Calcium	Ca^{45}	180 days	beta, 0.25 mev.	$33 per 0.8 mc.	Skeletal metabolism
Fluorine	F^{18}	112 minutes	beta, 0.7 mev.	(cyclotron only)	Skeletal studies; fluorosis
Carbon	C^{14}	5,100 years	beta, 0.154 mev.	$50 per mc.	Metabolic studies
	C^{11}	20 minutes	beta, 0.95 mev.	(cyclotron only)	

the radioactive atoms present decay. It is usually not feasible to carry on an experiment for longer than 5 half-lives (at which time only 3 per cent of the original activity remains). For this reason, isotopes with a half-life of less than 12 hours cannot be used for chronic experiments, and are inconvenient even for acute experiments. On the other hand, there is a reluctance to use radioactive isotopes with a half-life longer than 2 months in human beings because of the possible harmful effects of long continued chronic radiations.

A list of the radioactive isotopes commonly used in medicine and dentistry is given in the table, along with the cost and certain important properties. The most widely used have been radiophosphorus (P^{32}), radioiodine (I^{131}), radiosodium (Na^{24}), and radioiron (Fe^{55}, Fe^{59}).

■ *Health Physics*

Although radioisotopes have been handled safely by thousands of people, they are potentially dangerous substances. The toxic effects of roentgen rays are well known, and it has been recommended by radiologists that exposure to these radiations should not exceed 0.1 roentgen per day. Similar precautions are necessary with the radiations from radioactive isotopes. In addition, special care must be

taken to prevent these toxic substances from getting into the body, since the tragic fate of the radium dial painters has demonstrated the fatal effects which may be produced. Such contamination can usually be prevented by following the general rules of surgical asepsis.

Because of these hazards, work with radioactive isotopes has generally been restricted to persons with previous experience, and to institutions equipped to supervise these activities.

■ *Safe Tolerance Dose*

In addition to the afore mentioned precautions, special care must be taken to safeguard the welfare of the patient when these substances are used clinically. Unless the radioisotope is being used for the therapeutic effect of its radiation, or there are other extenuating circumstances, the amount administered should not exceed a "safe tolerance dose." This has been defined by Marinelli, Quimby and Hine[1] as the amount which will deliver not more than 0.1 roentgen equivalents of radiation to any tissue of the body during the first 24 hours following administration. The "tolerance" values for the commonly used isotopes are given in the table.

■ *Applications in Medicine*

Less than 15 years have passed since George Hevesy used the first artificially prepared radioactive isotope, P^{32}, to study phosphorus metabolism in the rat. Since that time, the use of isotopes has become widespread, both in fundamental research and in clinical medicine. Over a hundred medical centers, universities and other institutions are actively engaged in isotope work, and in at least half of this number, there is considerable clinical use in the study, diagnosis and treatment of disease. A number of excellent reviews[2-5] are available, and attention is directed to the fine monograph by Low-Beer[6] which is soon to be published.

In this paper, only the more important clinical uses will be considered, and there will be no attempt to consider the numerous applications in the field of pure research.

■ *Radiophosphorus, P^{32}*

Radioactive phosphorus was the first radioactive isotope to be produced artificially, and is still one of the most useful. It is cheap and readily available; the half-life is convenient (14.3 days), and the beta radiation which it emits is strong and easily measured. Phosphorus is one of the most important elements in the body, and participates in almost all of the metabolic processes. For this reason, radiophosphorus has been invaluable in studying the metabolism of protein, fat and carbohydrate, and in research on bones and teeth.

Since it is an essential part of the nucleoprotein formed in growing cells, it tends to concentrate in areas of rapid cell growth such as are found in tumors. This

1. Marinelli, L. D., Quimby, E. H., and Hine, G. J., Dosage Determination With Radioactive Isotopes: Practical Considerations in Therapy and Protection. *Am. J. Roentgenol.* 59:260 (Feb.) 1948.

2. Kamen, M. D., *Radioactive Tracers in Biology*. New York: Academic Press, 1947.

3. Clarke, H. T., and others, *A Symposium on the Use of Isotopes in Biology and Medicine*. Madison, Wis.: The University of Wisconsin Press, 1948.

4. Lawrence, J. H., and Hamilton, J. G., editors, *Advances in Biological and Medical Physics*, vol. 1. New York: Academic Press, 1948.

5. Hevesy, G., *Radioactive Indicators: Their Application in Biochemistry, Animal Physiology and Pathology*. New York: Interscience Publishers, 1948.

6. Low-Beer, B. V. A., *The Clinical Use of Radioisotopes*. Philadelphia: H. Thomas and Sons, in press.

fact has been applied clinically to the localization of brain tumors and superficial breast cancer, using a sensitive Geiger counter to detect the areas in which the radiophosphorus is concentrated.

The localization of radiophosphorus in bone and in rapidly proliferating cells suggested that it might be of value in treating the rapidly growing bone marrow cells characteristic of leukemia.

Although first tried in 1936, it was not until 1939 that Lawrence, Scott and Tuttle[7] reported the response in chronic leukemia and recommended its clinical use. Radiophosphorus is now widely used for treatment of leukemia. The results have been reviewed by Reinhard and others.[8] Radiophosphorus treatment of chronic leukemia (both lymphatic and myelogenous) appears to be at least as satisfactory as total body roentgen therapy, and produces far less discomfort to the patient. While Lawrence claims that it may prolong life somewhat, it is not curative, and eventually the condition no longer responds to treatment.

Radiophosphorus has also proved very useful in the treatment of polycythemia vera, a blood disease in which there is excessive production of red cells. In most centers, this is now considered the treatment of choice,[9] and one course of treatment frequently brings relief of symptoms for six months to several years. Treatment of other types of tumor with radiophosphorus has, on the whole, proved unsatisfactory.

Recently, Low-Beer[10] has used radiophosphorus soaked on small pieces of blotting paper to treat superficial skin lesions, including hyperkeratoses and basal cell carcinoma. Because the beta rays from P^{32} penetrate only a few millimeters into the skin, only the superficial lesion is irradiated, and the deeper tissues escape injury.

■ *Radioiodine, I^{131}*

Radioiodine has proved equally useful in clinical medicine. Indeed, P^{32} and I^{131} account for over two thirds of the isotope shipments from Oak Ridge. I^{131} has an 8 day half-life, and emits both beta and gamma radiations.

The metabolism of iodine is closely bound to the function of the thyroid gland. Hertz and Evans, in 1938, reported a rapid concentration of radioiodine in the thyroid gland of rabbits. Hamilton and Soley measured the uptake of radioiodine directly in patients by placing a Geiger counter tube over the skin of the neck directly above the thyroid. By this *in vivo* technic, characteristic uptake curves were obtained in normal humans, and in patients with thyroid disease. Such studies have frequently been of great help in diagnosing diseases of the thyroid.

Further information has been obtained by studying thyroid glands removed from patients with hyperthyroidism who had been given radioiodine. When a thin section from such a gland was placed in contact with x-ray film, the radiations from I^{131} caused a darkening of the film corresponding to the site of deposition of

7. Lawrence, J. H., Scott, K. G., and Tuttle, L. W.: Studies on Leukemia With Aid of Radioactive Phosphorus. *Internat. Clin.* 4:33 (Sept.) 1939.

8. Reinhard, E. H., Moore, C. V., Bierbaum, O. S., and Moore, S.: Radioactive Phosphorus as a Therapeutic Agent. *J. Lab. & Clin. Med.* 31:107 (Feb.) 1946.

9. Erf, L. A.: Radiophosphorus as Treatment of Choice in Primary Polycythemia. *Am. J. Med.* 1:362 (Oct.) 1946.

10. Low-Beer, B. V. A.: External Therapeutic Use of Radioactive Phosphorus; Erythema Studies. *Radiology* 47:213 (Sept.) 1946.

the radioiodine. Such radioautographs showed a much greater concentration of radioiodine in the overactive areas of the gland than in normal thyroid tissue. This at once suggested a means of destroying these hyperactive cells by the concentrated radiations from I^{131} without damage to the normal tissue. Early trials in Boston, New York and San Francisco demonstrated the feasibility of this procedure for treating hyperthyroidism. The results obtained were at least as good as those with surgical treatment or thiouracil.[11] Radioiodine therapy is now well established, and almost a thousand cases of hyperthyroidism have been successfully treated with no apparent serious complications. However, the other two methods of treatment (surgical and thiouracil) are equally effective, and there is some reluctance in many centers to use radioactive isotopes, especially in young patients.

Unfortunately, attempts to treat thyroid cancer with radioiodine in the same manner have been generally unsuccessful, because the cancer cells do not usually take up any iodine. In a few cases in which the thyroid cancer was well differentiated and concentration of radioiodine did occur, regression of the tumor and relief of pain were obtained.

In addition to these specific uses in treating thyroid disease, radioiodine has also proved of value in other clinical conditions. G. E. Moore found that diiodofluorescein tagged with radioiodine localized in brain tumors, and could thus help the surgeon to locate the exact site of the tumor. Radioiodine has also been used to "tag" blood protein (by iodination) in studies of blood volume in kidney disease, shock and heart disease.

■ *Radiosodium, Na^{24}*

Radiosodium (Na^{24}), despite its short half life (14.8 hours), has proved extremely useful. In the form of sodium chloride, it has been used to study the passage of ions across the placenta or into the spinal fluid. Absorption of radiosodium from the normal vagina was found to be low; immediately after delivery, the absorption increased from tenfold to a hundredfold, indicating the danger of absorption of toxic materials from the vagina at this time.

Since sodium is distributed throughout the extracellular space of the body, the dilution of an injected dose of radiosodium has been used to measure the extracellular fluid. This measurement is complicated somewhat by the uptake of radiosodium in bone.

Radiosodium has also provided new technics for the cardiologists in studying circulatory diseases. By injecting radiosodium into a vein in one arm, and measuring, with a Geiger counter, the time required for the radioactivity to reach the opposite arm, an accurate measure of the circulation time through heart and lungs can be obtained. It also has been most useful in studying peripheral vascular disease,[12] since anything which interferes with the circulation will delay the accumulation of radiosodium in the tissue spaces. In arteriosclerosis such measurements are frequently useful in following the progress of the disease; if removal of the leg be-

11. Chapman, E. M., and Evans, R. D., Treatment of Hyperthyroidism With Radioactive Iodine, *J.A.M.A.* 131:86 (May) 1946.

12. Mufson, I., Quimby, E. H., and Smith, B. C., Use of Radioactive Sodium as Guide to Efficacy of Drugs Used in Treatment of Diseases of Peripheral Vascular System, *Am. J. Med.* 4:73 (Jan.) 1948.

comes necessary, it may help in determining the site of amputation.

■ *Radioiron, Fe^{59}, Fe^{55}*

Radioiron has made its greatest contribution to research on fundamental problems of iron metabolism, carried out chiefly with animals. However, it has also been used clinically to demonstrate increased iron absorption in patients with iron deficiency anemia; in growing children, and in pregnant women. Ferrous iron salts, when given to anemic patients, were found to be absorbed 5 times as well as ferric salts.

However, the chief clinical applications have been with red cells "tagged" with radioiron in the hemoglobin. Such "tagged" cells provide a way to measure accurately the total red cell volume, a measurement of importance in surgical shock, severe burns and hemorrhage. They have also been used to study the survival of transfused blood cells, and to determine the best methods of blood storage.

■ *Miscellaneous Isotopes*

A number of other isotopes have found some use in medicine. Colloidal suspensions of radiogold (Au^{198}) and radioyttrium (Y^{90}) have been used to infiltrate cancer tissue, and so produce local radiation effects in the same way as radium needles. Radiocobalt (Co^{60}), with a 5.3 year half-life, has been used also in metal probes as a substitute for radium in treating superficial lesions. Although it had been hoped that radiostrontium, which behaves like calcium and localizes in bone, might be effective in treating bone tumors, the results have been disappointing. However, in one case of prostatic cancer with bone metastases and terrific bone pain, administration of radiostrontium resulted in some regression of metastases and prompt relief of pain.

■ *Applications in Dentistry*

Although the advantages of radioactive isotopes in studying certain dental problems have been stressed by McCauley in his excellent review,[13] the actual work has been limited. Much of this work has been concerned with the turnover of mineral in normal and diseased teeth, and with certain problems of skeletal metabolism.

Hevesy, in his first experiment with radiophosphorus in the rat, observed a considerable uptake of P^{32} in bones and teeth, including some turnover of phosphorus even in the enamel. Unerupted teeth and the growing incisors showed a much greater uptake than did the mature molars.

The mechanism governing this mineral exchange was studied by Hodge and others[14, 15, 16] who found that finely ground ash of bone, dentin, enamel and apatite all adsorbed radiophosphorus, radiostrontium and radiofluorine according to physical principles, the curves following the Freundlich isotherms. Such adsorption could account for the uptake of mineral by mature skeletal tissues; it does not,

13. McCauley, H. B., Significance of Radioactive Isotopes in Dental Research. *J.A.D.A.* 29:1219 (July) 1942.

14. Hodge, H. C., Van Huysen, G., Bonner, J. F., and Van Voorhis, S. N., Adsorption of Phosphates at 40° by Enamel, Dentin, Bone and Hydroxyapatite as Shown by Radioactive Isotope. *J. Biol. Chem.* 138:451 (April) 1941.

15. Hodge, H. C., Gavett, E., and Thomas, L., Adsorption of Strontium at 40 Degrees by Enamel, Dentin, Bone and Hydroxyapatite as Shown by Radioactive Isotope. *J. Biol. Chem.* 163:1 (April) 1946.

16. Volker, J. F., Hodge, H. C., Wilson, H. J., and Van Voorhis, S. N., Adsorption of Fluorides by Enamel, Dentin, Bone and Hydroxyapatite as Shown by Radioactive Isotope. *J. Biol. Chem.* 134:543 (July) 1940.

however, account for the greater uptake in areas of bone or tooth growth.

The relative uptake of P^{32} in various parts of the tooth were studied by Volker and Sognnaes,[17] who observed almost twice as much P^{32} in root dentin as in coronal dentin, while there was little in the enamel. By blocking the various parts of the tooth, Barnum and Armstrong[18] were able to determine the route of penetration of radiophosphorus. While most of the P^{32} came through the pulp, considerable amounts were able to penetrate through the cementum. Small but definite amounts were also able to get through the enamel.

Wassermann and others[19] studied the same problem *in vivo* in dogs. If the pulp was destroyed, or the canal was blocked, absorption of P^{32} was reduced 90 per cent. The residual penetration (10 per cent) presumably occurred through the cementum. This amount was further reduced in cases of periodontal disease.

Similar observations were noted in human patients[20] when exposed to mouth-wash solutions of phosphate containing P^{32}; little radiophosphorus penetrated the enamel. However, when a cavity was present, considerable amounts of P^{32} penetrated to the dentin through the carious area.

The only isotope available for the study of fluorine, F^{18}, has a very short half-life (112 minutes), which limits its use. Volker and others[21] found definite amounts of F^{18} taken up by dental tissue even after only 35 minutes. The largest amounts were found in the root dentin and in the growing areas of rat incisors. Because of the interest in topical application of fluoride to teeth, it would be interesting to study the uptake of F^{18} by normal enamel and by carious areas.

■ *Conclusions*

Although still limited in their use, radioactive isotopes have already attained a real and important place in clinical medicine. They should also prove useful in dental research because they provide one of the few methods for studying the limited metabolic activity of bone and tooth structures. The ease with which minute amounts of these radioactive materials can be accurately measured and distinguished from the mass of inert mineral in the tooth is particularly valuable. These readioactive materials should be of value in the study of calcification, mineral exchange, fluorosis, carious changes, periodontal disease, root resorption, dental nutrition and many other related problems.

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Spread of injected materials in the head and neck of the monkey

■ *Louis R. Burman, D.D.S., New York City*

Infections of the head and neck occur and spread in sufficient frequency to warrant serious consideration.

Many clinicians, both dental and medical, attempt to explain the spread of infections on the basis of fascial layers which are often differently described in the literature, and in various textbooks. The lack of accord in these writings has resulted from investigators, often with a preconceived idea, dissecting and demonstrating on cadaverous material what they believed to be a continuous layer of fascia. Injections of radiopaque material and dyes have been tried in cadavers which are not suitable for the spreading of these materials. The fascial planes have thus been largely man made or artificially made. The clinician, with his basic textbook knowledge, is often left in a quandary when he observes that the course of some infection does not correlate with those ideas of fascial layers presented to him early in his training.

A better conception of where the infection might spread may be given the clinician if the paths of least resistance and the barriers to this spread were demonstrated experimentally.

An attempt to clarify the course that infections may more often take seemed justified by doing some experimental work on the rhesus monkey whose head and neck anatomy closely resembles that of man.

■ *Methods*

Four regions in the head from which infections commonly start or through which they may spread were chosen for the introduction of material. They were: the pterygomandibular region; a region in the floor of the mouth; the posterior superior alveolar region; the retropharyngeal region.

The pterygomandibular region is bounded superiorly by the inferior surface of the lower head of the external pterygoid muscle; inferiorly by the junction of the inner surface of the angle of the mandible with the insertion of the internal pterygoid muscle; laterally by the ramus of the mandible; medially by the internal pterygoid muscle; posteriorly by the deep portion of the parotid gland and anteriorly by the apposition of the anterior part of the internal pterygoid muscle and the deep portion of the temporal muscle, reinforced by the buccopharyngeal fascia. In this region injections are frequently made to secure anesthesia of the inferior alveolar nerve.

The region in the floor of the mouth is a wedge-shaped potential space between

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From the Department of Anatomy, College of Dentistry, New York University, New York City.

Figures 2, 3, right, 5, and 6, *B* and *C* have been retouched from original color photographs. Figure 6, *A* has been retouched from an original roentgenogram.

the tongue and the inner surface of the mandible. Superiorly, it is covered by the mucous membrane lining the floor of the mouth, while inferiorly its apex is formed by the inner surface of the mandible with its mylohyoid muscle attachment and the intrinsic muscles of the tongue. Infections often start in this region.

The posterior superior alveolar region is posterior and above the maxillary tuberosity from which emerge the posterior superior alveolar nerves. In close relation with this region are the external and internal pterygoid muscles, the buccopharyngeal fascia, the temporal and infratemporal fossae and the temporal muscle. Injections are often made in this region to secure anesthesia of the upper molar teeth.

The retropharyngeal region is a potential space, behind the pharynx and in front of the prevertebral muscles. Superiorly it reaches the base of the skull and inferiorly it passes into the posterior mediastinum. It is by way of this space that most people claim infections spread inferiorly.

An attempt was first made to establish a fulminating infection in the animal. Septic material was obtained from a fulminating neck infection in man and was cultured. Two strains of alpha micro-aerophylic streptococci were isolated in a 10 to 1 ratio. Pure cultures were isolated in a thioglycolate medium and a solution was prepared in a brain-heart infusion in the same ratio as was originally found. One cubic centimeter containing many more than a million organisms was injected in the pterygomandibular region. No infection resulted.

The next problem was to find a suitable material for injection that would lend itself to roentgenographic technics. After numerous trials, the best results were obtained with Lipiodol. This material when warmed and injected seemed to spread at body temperature and continued to remain in the tissue over a six month period without being completely resorbed and eliminated by the body. While the roentgenograms were satisfactory, they did not give a three dimensional picture nor could the plane in which the material was located be determined with accuracy. A dye which could be mixed with and injected together with the Lipiodol, which would not be resorbed and which could be followed when the animal was sacrificed, was then sought. After many attempts lampblack in oil was found to be suitable. The preparation finally used consisted of equal parts of lampblack in oil and Lipiodol which were mixed and warmed together before being injected into the experimental animal.

It is realized that the injection of this material does not entirely simulate a fulminating infection in which the septic material is present under pressure and where there is a change in hydrogen ion concentration in the involved region, but the material did spread sufficiently to warrant its recording.

In the first attempts injections of 2 to 4 cc. were used. Observations showed that a much more extensive and rapid spread of the material occurred with the greater amounts. It was decided to limit the material to 2.5 cc. of the mixture in all injections. To make sure that the material was deposited in the proper place roentgenograms were taken with the needle in position before deposition of the material. Following these injections, roent-

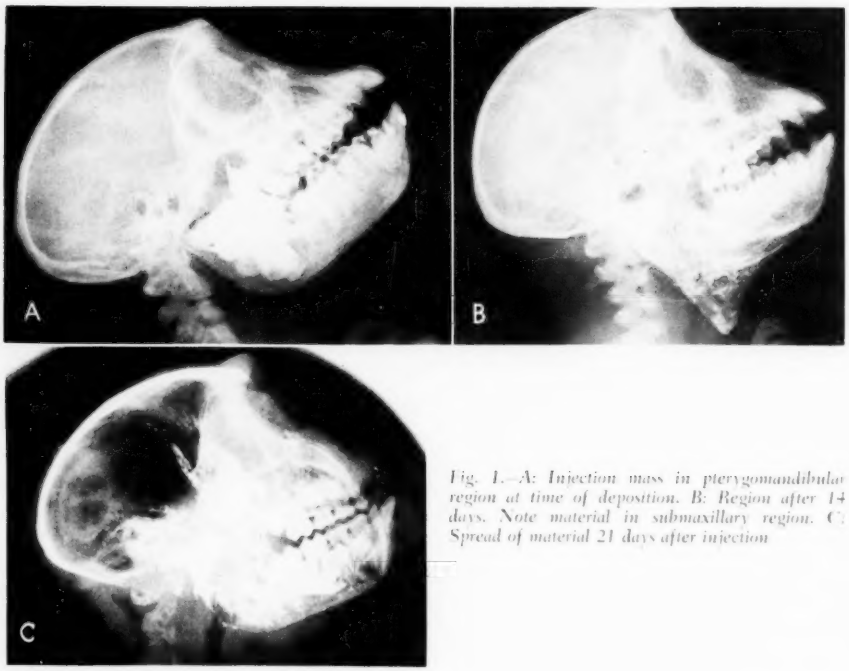

Fig. 1.—A: Injection mass in pterygomandibular region at time of deposition. B: Region after 14 days. Note material in submaxillary region. C: Spread of material 21 days after injection.

genograms were taken at varying intervals up to 21 days after which the animal was sacrificed. The animal was then dissected and the path taken by the injected material was followed. Experiments were conducted on three monkeys for each region (pterygomandibular, floor of mouth, posterior superior, retropharyngeal), a total of 12 monkeys being used in the final experiments.

■ *Observations*

The distribution of the injected material was studied in all regions roentgenographically and by dissection.

PTERYGOMANDIBULAR REGION—Injection of the material was made in the pterygomandibular region, at the opening of the mandibular foramen.

Roentgenographic Observations—At the time of injection the material was contained in a region roughly the shape of the pterygomandibular region (Fig. 1, *A*). When greater amounts, up to 4 cc., were introduced the material forced its way beyond the original limits of the region with a tendency towards a greater spread in a superior direction.

At the end of 24 hours, some of the material had left the pterygomandibular

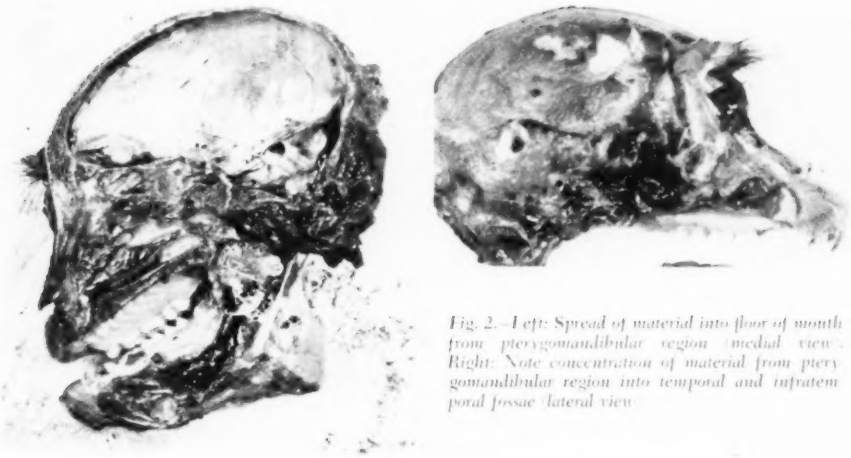

Fig. 2.—Left: Spread of material into floor of mouth from pterygomandibular region (medial view). *Right:* Note concentration of material from pterygomandibular region into temporal and infratemporal fossae (lateral view).

region and was found in the deep submaxillary region and in the floor of the mouth. In subsequent time intervals (up to 21 days) the material remained in the same relative region (Fig. 1, *B*, C). In one animal the material did not involve the submaxillary region (Fig. 1, C). In all cases the floor of the mouth was invaded.

Dissection Findings After 21 Days—From the point of injection in the pterygomandibular region, the material was found in the temporal and infratemporal fossae surrounding the external pterygoid muscle. In its passage to the temporal and infratemporal fossae and towards the sphenomaxillary fissure, heavy deposits of material were found along the internal maxillary artery. Some of the material was found on the deep surface of the temporal muscle as far posteriorly as the temporomandibular joint capsule and the deep portion of the parotid gland (Fig. 2). The material was present lateral to the internal pterygoid muscle and posterior to the buccal pad of fat. The material had spread through the mandibular notch along the deep surface of the masseter muscle.

Lampblack was found along the path of the lingual nerve from the pterygomandibular region, under the mandibular attachment of the superior constrictor muscle, in the floor of the mouth as far forward as the first bicuspid teeth, and superior to the mylohyoid muscle (Fig. 2, left). Some of the material spilled over the posterior margin of the mylohyoid to involve the deep surface of the superficial part of the submaxillary gland capsule.

There was no material in the parotid gland, retropharyngeal or parapharyngeal spaces or in the neck region other than around the submaxillary gland capsule. There was no evidence of actual muscle penetration by the material.

The spread of injected material in the pterygomandibular region was thus

observed to a great extent along the blood vessels and nerves.

FLOOR OF THE MOUTH—Injection of the material was made beneath the mucous membrane in the floor of the mouth in the region between the lower first and second molars.

Roentgenographic Observations—At the time of injection the material was localized at the site of its deposition. At subsequent time intervals (up to 21 days) there was a gradual spread of the material posteriorly and inferiorly. In 21 days, not only was there a concentration of the injection mass at the site of injection but also considerable distribution of it posteriorly and to a great extent inferiorly in the neck (Fig. 3, left).

Dissection Findings After 21 Days—Upon incision of the mucous membrane in the floor of the mouth the material was found concentrated around the sublingual gland, the lingual nerve and Wharton's duct, all of these being superior to the mylohyoid muscle.

The lampblack was followed posteriorly along these structures to the free border of the mylohyoid muscle where the material had spilled over and spread around the capsule of the submaxillary gland. From here, the injection mass was found along the external surface of the posterior belly of the digastric muscle as far posteriorly as the mastoid region where it remained under the superior attachment of the sternomastoid muscle.

Inferiorly, the material was deep to

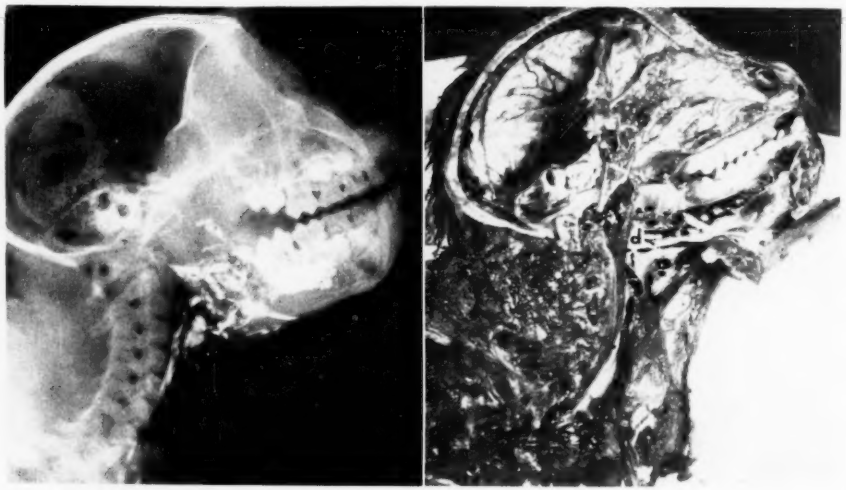

Fig. 3.—Left: Floor of mouth after 21 days. Note inferior and posterior extension of injection mass. Right: Note posterior extension of material along digastric muscle (d), inferior extension to submaxillary region and to manubrium sterni

the hyoid bone, anterior and lateral to the trachea, some being found as far inferiorly as the manubrium sterni (Fig. 3, right).

POSTERIOR SUPERIOR ALVEOLAR AREA—The material was injected posteriorly and superiorly to the maxillary tuberosity close to the bone (Fig. 4, *p*).

Roentgenographic Observations—In subsequent time intervals (up to 21 days) there was a spread of the material in all directions: anteriorly as far forward as the nose, posteriorly to the region of the ear, inferiorly to the lower border of the mandible and superiorly to the temporal bone, to a level about an inch above the zygomatic arch.

Dissection Findings After 21 Days—The material was first seen under the skin—superficial to the buccinator muscle, inferior to the zygoma, along the lower portion of the orbit, and lateral and inferior to the nasal bone. The material extended posteriorly under the skin to the anterior part of the parotid gland (Fig. 5).

On deep dissection the material was found mostly localized anterior to the temporal muscles but some had spread anteriorly and deeply nearly to the sphenomaxillary fissure. There was some injection mass at the anterior margin of the internal pterygoid muscle, where it lies in close contact with the temporal muscle. Some injection material was also found medial to the internal pterygoid muscle.

The lampblack was found deep to the anterior part of the zygomatic arch, in the temporal and infratemporal fossae, completely permeating the fatty tissue lying in these fossae.

RETROPHARYNGEAL REGION—The injection was made directly posteriorly through the oral cavity, through the superior constrictor muscle, slightly lateral to the midline.

Fig. 4. Posterior superior alveolar region (p) at time of injection (left side). Retropharyngeal region (r) at time of injection (right side).

Roentgenographic Observations—Immediately after the injection, there seemed to be a spread of the material inferiorly and superiorly (Fig. 4, *r*).

In subsequent intervals (up to 21 days) there was a spread of the material mostly in an inferior direction. However, some spread laterally and even a small amount crossed the midline. After 21 days there was evidence of material in the mediastinal region and at the base of the skull (Fig. 6, *A*).

Dissection Findings After 21 Days—The injection mass was first encountered lateral and medial to the sternomastoid

muscle near its attachment to the skull, along the lateral surface of this muscle at its inferior attachment to the sternum (Fig. 6, *B*).

Reflection of the sternomastoid muscle revealed the material deep to that muscle and as far laterally as the clavicular scapular junction. The lampblack was deeply embedded and could be seen lying along the components of the brachial plexus of nerves. Injection material was also found deep to the inferior thyroid muscles. The material had passed across the midline, deep to the manubrium sterni, deep to the clavicle and the lower part of the omohyoid muscle (Fig. 6, *B*, *C*).

Upon removal of the thoracic cage the material was found anterior to the trachea and esophagus and in the anterior mediastinum (Fig. 6, *B*, *C*).

Deep dissection showed the injection mass present in the carotid sheath, between the trachea and esophagus, behind the esophagus, anterior to the descending aorta and in the posterior mediastinum (Fig. 6, *C*).

In the region of injection some of the material had spread along the hypoglossal nerve, superiorly to the base of the skull, anteriorly to the longus colli and longus capitus muscles and deep to the constrictor muscle of the pharynx.

■ *Summary*

The spread of injected materials in four regions of the head has been demon-

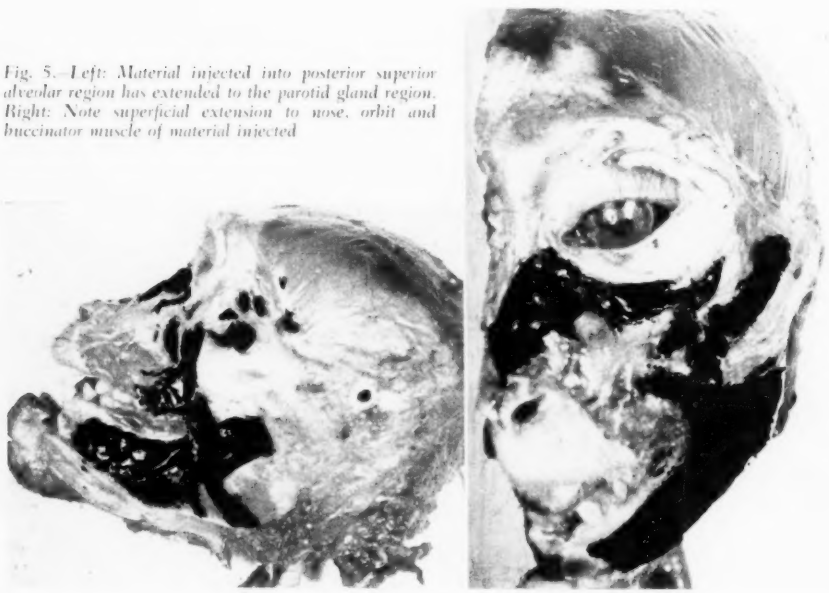

Fig. 5.—Left: Material injected into posterior superior alveolar region has extended to the parotid gland region. Right: Note superficial extension to nose, orbit and buccinator muscle of material injected

strated and it seems probable that foreign material in the body would travel along similar paths of least resistance stopped at times by barriers along its path. The most direct paths of least resistance seem to be along structures such as blood vessels, nerves, or organs which are encapsulated or sheathed.

From the pterygomandibular region the paths of least resistance seemed to be along the lingual nerve and along the internal maxillary artery. The muscles themselves probably act as barriers but their surfaces may become involved by this proximity to nerves and blood vessels. Definite fascial attachments such as the

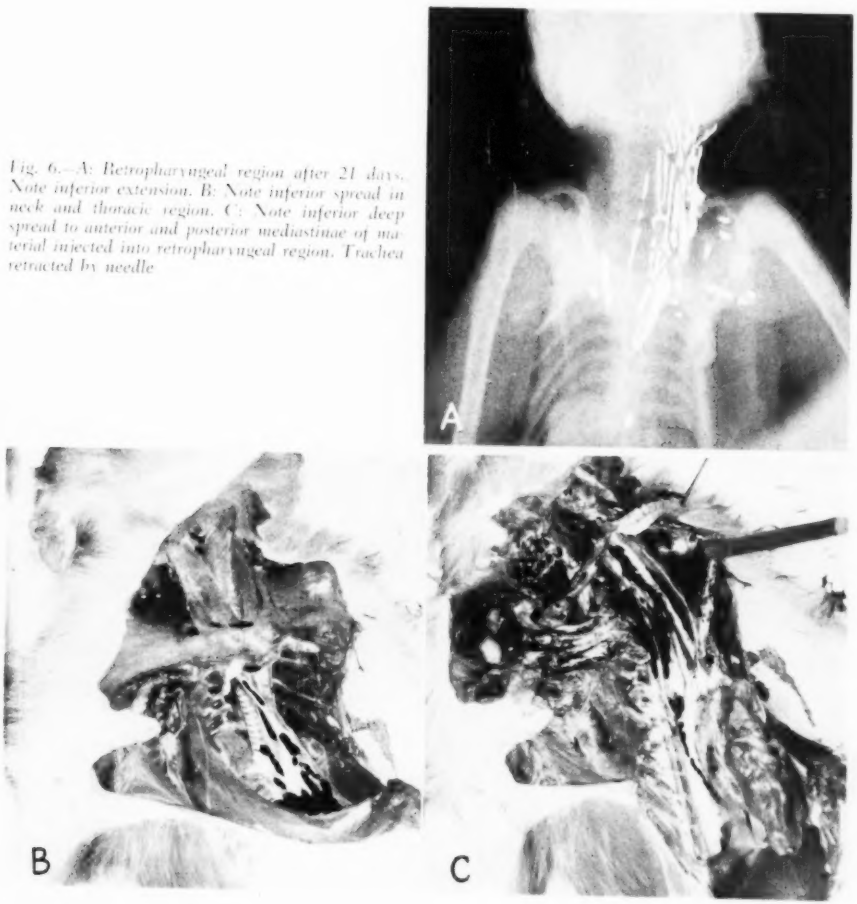

Fig. 6.—A: Retropharyngeal region after 21 days. Note inferior extension. B: Note inferior spread in neck and thoracic region. C: Note inferior deep spread to anterior and posterior mediastinae of material injected into retropharyngeal region. Trachea retracted by needle.

buccopharyngeal attachment to the mandible act as barriers and material will not penetrate but go over or below this point. This was also demonstrated by the deposition of material around the submaxillary gland capsule with no evidence of material in the gland itself. The passage of material to this region was along Wharton's duct.

From the floor of the mouth the spread of material was along the lingual nerve and Wharton's duct. Its inferior extension was aided by the pathway provided by the trachea and its envelope of fascia.

The posterior superior alveolar vessels and nerves served as pathways to the sphenomaxillary and deeper regions from the posterior superior alveolar region. The course of the material into the superficial fascia of the face was superior to the attachment of the buccopharyngeal fascia to the maxilla. The strong fascial attachment at the lower border of the orbit and on the zygoma limited the spread.

The carotid sheath formed the main pathway for the spread from the retropharyngeal region. This was aided by such structures as the brachial plexus of nerves, hypoglossal nerve, the trachea, esophagus and the aorta.

An objective method of recording the healing rate of cysts of the jaws

■ *Henry B. Clark, Jr.,* M.D., D.D.S., and Mellor B. Holland,† D.D.S., M.S.D., Minneapolis*

Operations upon large benign cysts of the jaws are mainly of two types: (1) primary closure with sutures, in anticipation of aseptic organization of the clot; (2) creation of an aperture or window through which treatment in the form of dressings or irrigations may be done. The latter group includes: (*a*) procedures of the Partsch[1] type, where the epithelial sac is left in place; (*b*) the enucleation or curettage operations in which the entire fibrous sac and epithelial lining are taken out.[2]

Healing in the window type of procedure is slow, but the plan is still used by many oral surgeons because of the feeling of certainty of outcome. Progress of healing is determined by visual examination and written notes, serial roentgenographs taken at intervals, or possibly by the length of gauze strip required to fill the cavity, if that treatment plan is being used.

A more convenient and accurate method of following the progress of healing would be desirable in order to compare the relative speed of filling in for

*Chairman, Division of Oral Surgery, School of Dentistry, University of Minnesota, Minneapolis.

†Clinical assistant professor, Division of Oral Surgery, School of Dentistry, University of Minnesota, Minneapolis.

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2. Waldron, C. W., Cystic Tumors of the Jaws. *Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.)* **27**:313 (June) 1941.

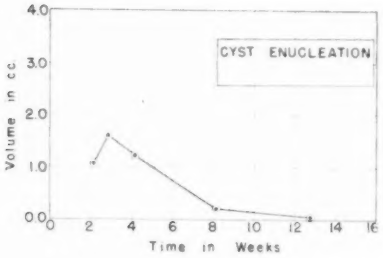

Fig. 1.—Rate of filling in of cavity after cyst enucleation

different age groups, and also for different types of operations. It would be of interest to compare, for example, the rate of filling in when the Partsch operation is employed as against enucleation of the cystic membrane.

Roentgenographic studies have limitations as follow-up records for two reasons: first, evidence of ossification comes rather late, when immature bone changes to mature bone (Weinmann and Sicher[1]); second, only a two dimensional picture is provided. The need is for a three dimensional or volumetric progress record of the filling in of connective tissue.

■ *The Method*

Four patients were used in this series. Three had cysts of the mandible, all of which were managed by the dissection and enucleation technic. In each case the bony cavity was dressed with iodoform gauze strip one-half inch in width, saturated with Acrithesin ointment. The dressing was changed at four day intervals until the wound was completely comfortable and all bone covered with firm pink or red granulations. Each patient was then given a chip blower syringe and requested to flush out the cavity with warm water at least once daily.

One patient had a large cyst of the maxilla, with all teeth present, and the Partsch type of procedure was done.

In all cases measurements of the volume of the bony defect were made at intervals by using a Luer syringe fitted with a 1½ inch, 20 gage needle. The end of the needle had been previously annealed in the bunsen burner, its point cut off and the distal third fashioned into a curve. To take a reading the patient was seated in the dental chair with his head in such a position that the cavity would hold fluid up to the brim when filled. The cavity was carefully dried with the suction aspirator or cotton, and the area isolated with cotton rolls. The Luer syringe was then filled with exactly 5 or 10 cc. of warm tap water. The point was simply to have a known excess of water to start with. In the case of a very large cyst a 25 or 50 cc. syringe could be used.

[1] Weinmann, J. P., and Sicher, H., *Bone and Bones*, St. Louis, The C. V. Mosby Company, 1947, p. 309.

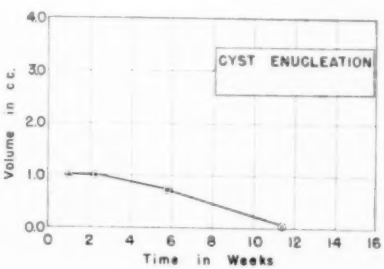

Fig. 2.—Rate of filling in of cavity after cyst enucleation

but the smaller the bore, the greater the ease of injection and manipulation. The tip of the small cannula was then gently introduced into the cavity formerly occupied by the cyst and water slowly injected until the cavity was exactly filled. This amount of fluid was readily calculated by subtraction from the known amount in the syringe. Readings were plotted on a graph with the volume on the ordinate and passage of time on the abscissa.

Three of the cases are represented by graphs in Figures 1, 2 and 3. The maxillary cyst managed by the Partsch procedure has still not become obliterated but is asymptomatic and the patient refused surgery (Fig. 3). Histologically no evidence of ameloblastoma or other tumor was found. The fourth case is reported here.

■ *Report of Case*

A white man, aged 61, was referred to the clinic for care of a presumed cyst in the left mandible. There had been profuse purulent discharge following extraction of a bicuspid tooth in this region. A lateral jaw roentgenogram revealed an elliptic radiolucency approximately 2 by 5 cm. extending from the first molar to the lateral incisor regions (Fig. 4, A). On November 17, 1948, under block anesthesia, an ample mucoperiosteal flap was raised over this region and a defect in the cortical bone promptly encountered. The thick, fibrous wall of the cystic lesion was peeled from the bony cavity and removed in sections in order to gain better access for the dissection near the inferior alveolar and mental nerves. Although these structures were adherent to the fibrous wall of the cyst, they were separated without tearing. Bleeding during the operation was moderate. When drying and inspection of the cavity revealed no further fragments of cyst wall, a 40 cm. length of one-half inch iodoform gauze saturated with Acrithesin ointment was used to lightly fill the bony cavity. The pathological report was "Cyst wall sections. Squamous epithelium covering fibrous wall with chronic inflammation throughout."

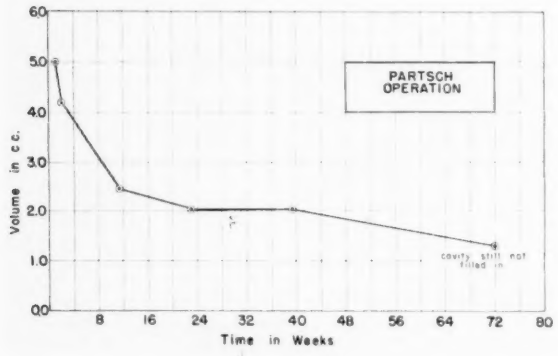

Fig. 3.—Rate of filling in of cavity after Partsch operation for cyst of the maxilla. Cavity has failed to fill in completely

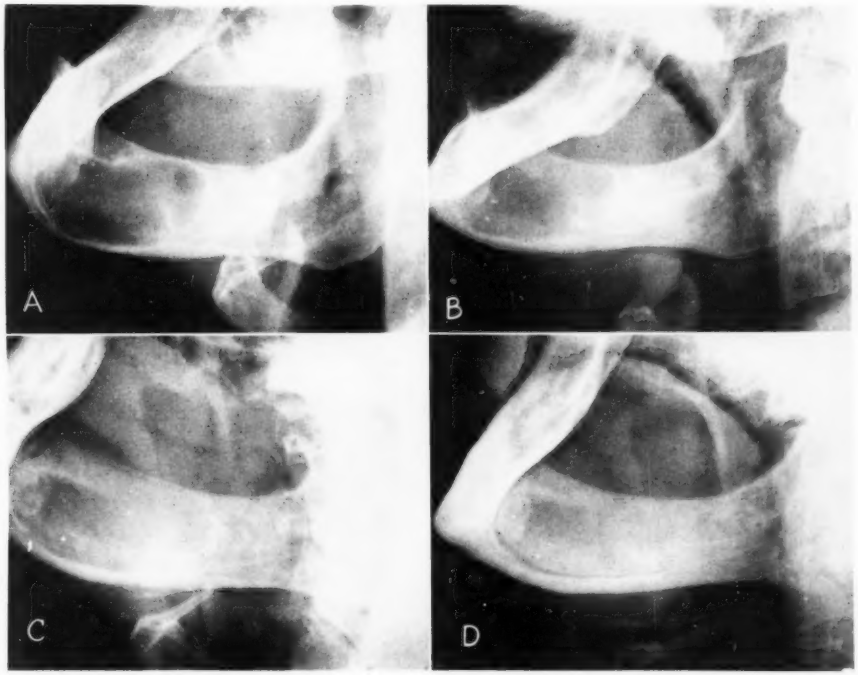

Fig. 4.—A: preoperative appearance of the mandibular cyst. B: Three months after removal of the cyst. C: Five months after removal of the cyst. D: Nine months after removal of the cyst.

Penicillin, 300,000 units, in the form of Duracillin was administered intramuscularly once daily for the first three postoperative days. On the second postoperative day there was considerable swelling of the left lower face and some numbness and tingling of the left lower lip and chin. On the fifth day the dressing was changed for the first time. Sensation had returned to the patient's lip and there was no numbness or tingling. The swelling was beginning to subside. The dressing was changed in the same manner on the seventh, eleventh, fifteenth, nineteenth, twenty-second, twenty-sixth and twenty-ninth postoperative days. On the last visit the gauze was left out, as the cavity in the mandible was perfectly comfortable and was well covered with pink granulation tissue. The patient was given a chip blower syringe with which to flush out the cavity at least once daily.

During the postoperative period volumetric measurements of the defect in the mandible were made on the fifth, thirteenth, twenty-eighth, thirty-seventh, fifty-fourth and sixty-fifth days. On the latter date the cavity was completely

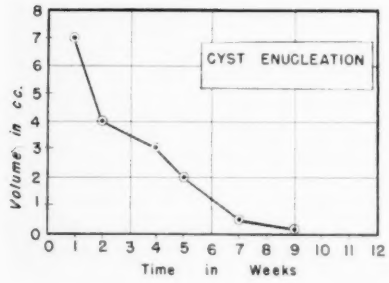

Fig. 5.—Progress of filling in of cystic defect. Compare with roentgenographic progress record shown in Figure 4

filled in. The results of these readings are indicated on the graph in Figure 5.

Roentgenographic studies of this portion of the mandible were made concurrently and are shown in Figure 4, *A*, *B*, *C* and *D*. It will be noted that evidence of ossification, or of tissues sufficiently dense to cast a perceptible shadow, was lacking until rather late in the healing phase, and would be difficult to evaluate and impossible to measure by any statistical means.

Two weeks after the last visit the patient reported to his own dentist for construction of a full lower denture, which he wore with success and comfort.

■ *Summary*

1. The healing rate of cysts of the jaws has previously been recorded only by progress notes or by serial roentgenograms.

2. Neither of these methods permits accurate comparison of cases differing as to age of patient or type of operation.

3. A simple method is presented whereby measurements of cubic content can be made and plotted on a graph, thus permitting objective comparison.

4. A case of mandibular cyst is reported in detail with serial roentgenograms and graphic plottings of volumetric water measurements at periodic intervals.

5. The measurements of three other cyst cases are shown as plotted on graphs.

■ Advances in Science

From the age of Galileo through the first half of the twentieth century the scientific movement has been led by the physical sciences. These sciences still retain indisputable supremacy as wellsprings of technological progress. But in our age more and more of the intellectually and philosophically significant advances in knowledge appear in the realm of biology. Man's deepest urge, after all, is to understand himself and his place in the Universe—to fathom his own nature as a living organism and the interactions between heredity and environment that shape the development of his body and mind.—*Theodosius Dobzhansky, "Genetics," Scientific American 183:55, September, 1950.*

Resection of tumor of the mandible and repair of the deformity: *report of case*

■ *Vawztad H. Kazanjian, M.D., D.M.D., Boston*

The patient consulted an oral surgeon in 1922, at the age of 32, because of an enlargement of the side of his face. A growth about the mandible was found, and an immediate operation was recommended but the patient neglected to undergo surgery.

I first saw him ten years later, on October 3, 1932 (Fig. 1, left). There was an encapsulated mass about the size of a lemon on the left side of the face. This mass seemed to originate from within the mandible, expanding the bone both externally and orally. It involved the ramus as well as the body of the mandible and passed beyond the median line. Mandibular movement was not limited, indicating that there was no involvement of the temporomandibular joint or of the muscles of mastication.

The roentgenographic report at that time was multicystic expansion of the left lower jaw from one-half inch below the condyle to the bicuspid region on the right. Teeth were incorporated in the tumor (Fig. 1, right). The diagnosis was consistent with adamantinoma. A biopsy of the mass, however, was reported as mixed tumor of the mandible. The patient was advised that a radical operation was necessary and that a large portion of the mandible would have to be removed, but he would not submit to surgery, fearing a facial deformity.

I did not see him again until 1944. The tumor had increased in size (Fig. 2), extending to the floor of the mouth. It still appeared as an encapsulated mass. Despite its large size, the patient did not have any limitation of motion of the mandible. An external fistula had formed discharging pus upon the face. The patient's general condition seemed to be poor, and after consultation with Dr. Ernest Daland,[1] it was decided that the only hope was to remove the tumor even though disfigurement would be permanent. This time the patient consented to an operation and was sent to the hospital on May 31, 1944.

General physical examination at that time was essentially negative except for some debilitation and anemia. There was no clinical evidence of metastases and roentgenographic examination revealed the lungs to be clear. Blood pressure was 110/60.

Laboratory work revealed: urine, normal; red blood count, 3,100,000; hemoglobin, 8.5; white count, 6,200; blood calcium, 9.7; phosphorus, 3.7; alkaline phosphatase, 3.6. The Hinton test was negative. Smear of discharge from tumor was negative for actinomycosis; positive for *Staphylococcus albus*, *Streptococcus hemolyticus* and anaerobic gram negative rods.

While in the hospital the patient was given three transfusions in order to bring the red blood count up to normal. On June 20 an operation was performed under intratracheal anesthesia. The first step was ligation of the external carotid artery; even then the capillary oozing became so persistent that a transfusion was necessary during the operation. Removal of the tumor in

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1. Ernest Daland, M.D., Chief of Staff, Pondville State Cancer Hospital, Boston.

Fig. 1.—Left: Appearance of patient in 1932. Right: Roentgenogram showing multicystic tumor of mandible in 1932

volved resection of the greater part of the mandible, extending from the left temporomandibular joint to the right last molar region. It was necessary to sacrifice a good deal of mucosa and skin tissue.

The operation was a long and tedious one. Initial blood pressure prior to operation was 120/40; at the end of the first hour it was 140/40. It then fell to 80/40 at the end of the second hour, and at the end of the third hour was 60/40. As expected, the patient was in critical condition. He had received 3,000 cc. of 5 per cent dextrose in saline followed by the blood transfusion. This transfusion was followed by another 500 cc. of whole blood, and upon administration of this, the patient's condition improved rapidly in the recovery room.

He was given, postoperatively, intravenous fluids and intravenous sulfadiazine, 2.5 Gm. daily for six days. Six days after the operation, the red blood count was 2,480,000 and the hemoglobin 6.1 Gm. In order to combat this anemia, he was given another 500 cc. blood transfusion. Feeding was a problem since the patient could not bring his lips together in order to swallow (Fig. 3, *A*). During the first few days, in addition to intravenous fluids, the patient received nourishment through a stomach tube, but eventually he learned to take fluids by mouth with a tube—the distal end of which

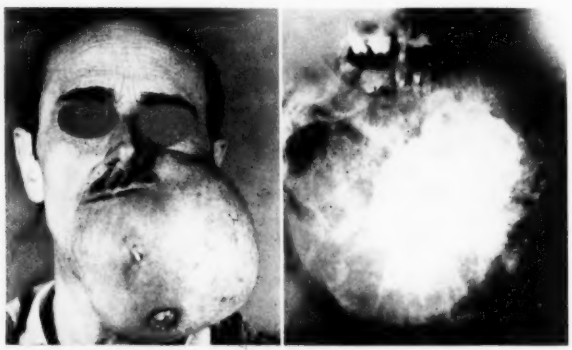


Fig. 2.—Left: Appearance of the patient in 1944. Right: Roentgenogram of the tumor in 1944

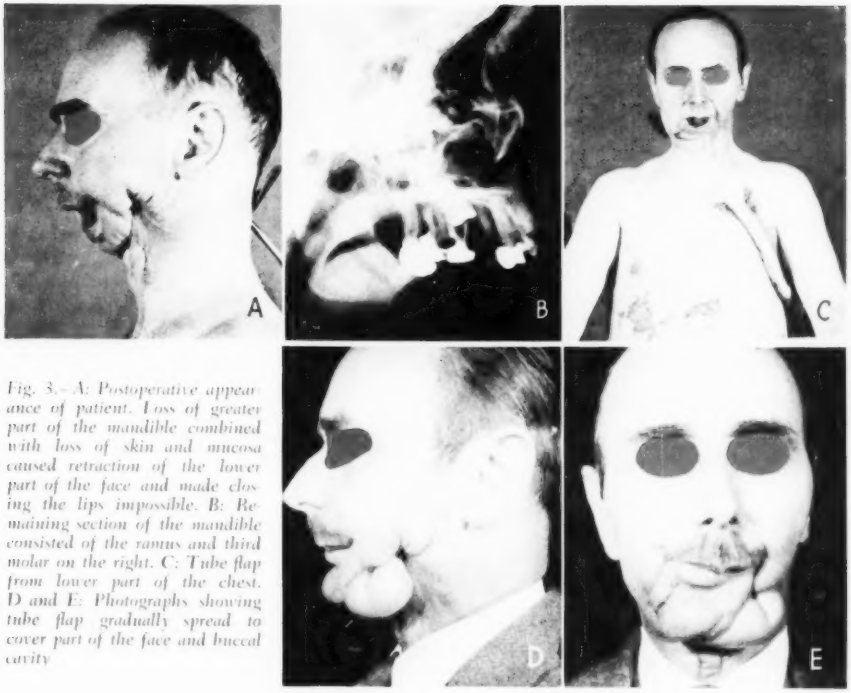


Fig. 3.—A: Postoperative appearance of patient. Loss of greater part of the mandible combined with loss of skin and mucosa caused retraction of the lower part of the face and made closing the lips impossible. B: Remaining section of the mandible consisted of the ramus and third molar on the right. C: Tube flap from lower part of the chest. D and E: Photographs showing tube flap gradually spread to cover part of the face and buccal cavity.

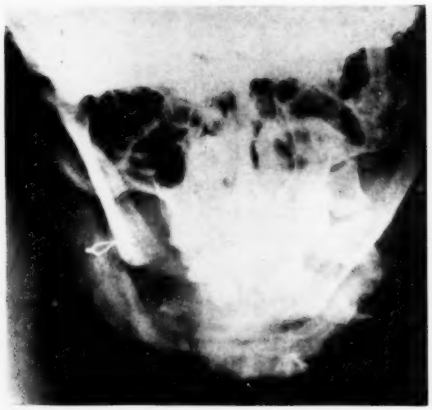
was attached to a large rubber bulb, which sealed the mouth, making it possible for him to procure liquids.

Convalescence was slow and steady. The resulting deformity consisted of extreme retraction of the face and chin because of loss of bone, mucosa and skin. The only remaining part of the lower jaw was a section of the ramus bearing one molar tooth on the right side (Fig. 3, *B*). This portion of the mandible showed no evidence of disease.

A few days after the operation, the remaining section of the lower jaw was immobilized by connecting it to the upper teeth by intermaxillary wiring, thus preventing it from being distorted or dislodged. The plastic repair of the patient started on September 13, approximately three months later. Plastic repair involved nine stages. The general outline is described.

The first operation prepared a large delayed flap on the non-hairy side of the chest (Fig. 3, *C*). At the subsequent operations, this flap supplied the soft tissues of the oral cavity and the face (Fig. 3, *D* and *E*). While plastic repair of soft tissues of the face was in progress, intraoral dental molds were adapted to the remaining segment of the mandible in order to prevent undue contracture of the soft tissues.

On November 19, 1945, the reconstructed soft tissues of the face were vascular enough for the transplantation of bone. The reconstruction of the mandible required three large blocks of iliac bone joined together, and also joined to the remaining segment of the mandible by stain-



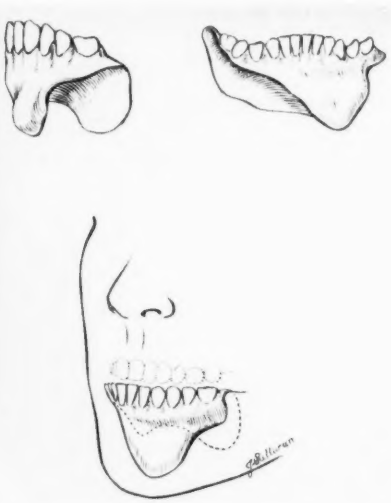


Fig. 4.—Left: Three large pieces of bone graft were joined together with stainless steel wire and transplanted to the lower jaw. Bone graft extended from the left temporomandibular region to the right molar. Right: Diagrams of lower denture. It is retained in position by a large pocket lined with skin

less steel wires. These were supplemented by chips of bone around each joint. The transplants extended from the left temporomandibular joint to the opposite mandibular stump (Fig. 4, left).

The establishment of bony framework improved the facial contour and the patient was able to control the lower part of the face.

The patient was supplied with a partial upper denture and a full lower denture. A series of dentures was made to meet the changing

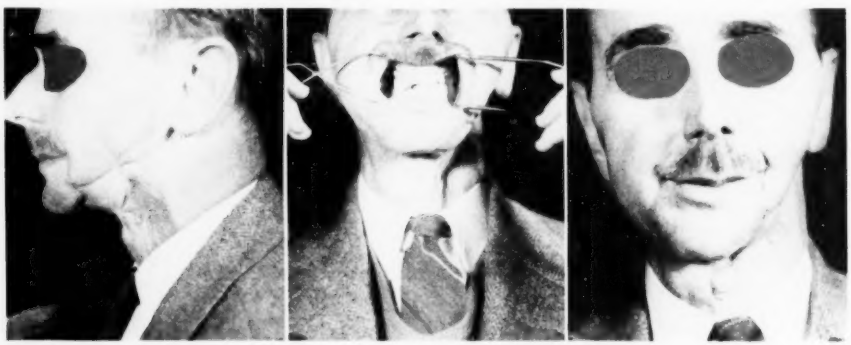


Fig. 5.—Final appearance of the patient in 1946 showing upper and lower dentures in position

conditions of each operation. Drawings of the lower denture are shown in Figure 4, right. Dental appliances as well as permanent dentures were made by Dr. Ferdinand Brigham,[2] of Boston. The final dentures provided excellent facial support and mastication (Fig. 5). To insure the retention of the lower denture, it was necessary to reconstruct the buccal sulcus and alveolar ridge over the transplanted bone. This was accomplished by cutting through the soft tissues over the newly formed body of the mandible nearby to its lower border until the periosteum was exposed over a well-formed ridge. This entire exposed area was covered with a skin graft.

Successful transplantation of skin graft within the mouth requires the usual precautions, and a mechanical retention over the raw vascular bed.

In this case, the skin graft carrier consisted of a specially made dental bite plate reinforced with dental compound to fit in the newly formed sulcus.

A large skin graft was spread over the undersurface of the dental base plate, placed in the mouth and retained in position firmly by circumferential wires extending from the upper

2. Ferdinand Brigham, D.M.D., Boston.

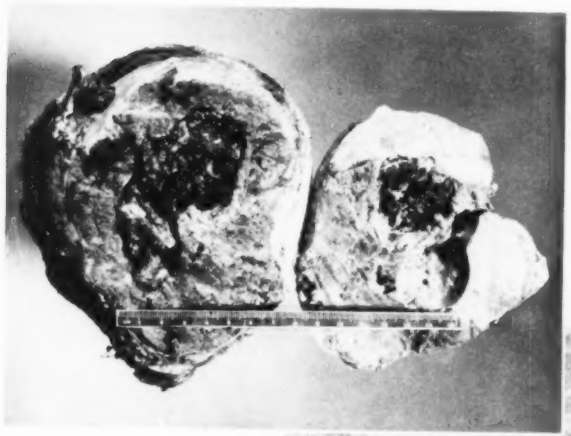
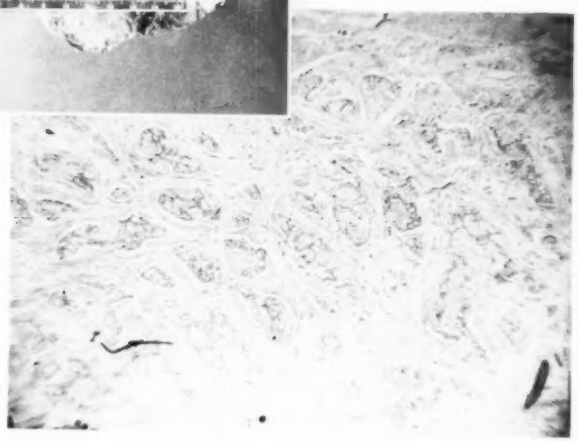


Fig. 6.—Left: Gross appearance of the tumor. On cut section the mass consisted of an area 8 by 5 cm. There were irregular fragments of calcification and, in some areas, bony hard material



Right: The tumor was composed of masses of variable size, but mostly small, of compactly arranged epithelial cells fairly uniform in size and structure

surface of the base plate to the skin under the jaw.

NATURE OF THE TUMOR—The gross specimen consisted of a large mass of firm reddish tissue measuring 15 by 15 by 14 cm. On cut section the mass consisted of an area 8 by 5 cm. (Fig. 6, left). It was gray, necrotic and foul smelling. There were irregular fragments of calcification and in some areas, bony hard material. There was some doubt about the nature of this tumor. It was evident that it belonged to a group of tumors considered locally malignant.

My provisional diagnosis in 1932 was adamantinoma; but several pathologists reported mixed tumor of the mandible. Judging from the literature, both types of tumors, adamantinoma as well as mixed tumor of the jaw, grow slowly and cause gradual expansion of the cortex of the bone. Both are locally malignant but seldom metastasize. Roentgenograms showed a polycystic appearance. Mixed tumors of the jaw, however, are considered a rare occurrence. In order to have an authoritative opinion on this tumor, I asked Dr. Shields Warren[3] to give his report after examining available slides.

"The sections represent an epithelial tumor which, judging from the structure alone, might have originated in the mucous serous glands of the soft tissues of the jaw or from paradental debris.

"The tumor is composed of masses of variable size, but mostly small, of compactly arranged epithelial cells fairly uniform in size and structure. The prominent features are: (1) the predominance of rounded rather than stellate or columnar cell forms; (2) the mucoid and hyalin material among the epithelial cells and in the stroma; (3) the tendency to cyst formation. The characteristic features of adamantinoma, the peripheral palisading of columnar cells around a central core of stellate reticulated epithelial cells, peculiar to the enamel organ, are not present.

"A definite histologic classification is not possible in this case. However, the fact that the tumor first appeared as a swelling within the mandible places it as an adamantinoma. The tumor corresponds with the cylindrical type of adamintinoma in Malassez's classification."

The patient, five years after operation, does not show any evidence of recurrence of the tumor. He has gained weight and has enjoyed good health. Also, he reports that he is able to wear his artificial dentures comfortably.—*475 Commonwealth Avenue.*

3. Shields Warren, M.D., Professor of Pathology, Harvard Medical School, and Pathologist at New England Deaconess Hospital, Boston.

■ The Patient's Emotional Needs

A dentist or a physician or an anesthetist will never reach the optimal results in his own field regardless of his diagnostic acumen or his manual dexterity and skill if he does not take into consideration the patient's emotional needs. The ability to understand and handle a patient's emotional needs extends the scope and usefulness of the doctor.—*Bernard B. Raginsky, "Some Psychosomatic Aspects of General Anesthesia," Anesthesiology 11:399, July, 1950.*

Thrombosis of ranine vein: *report of case*

■ *H. L. Hubinger, D.D.S., Saginaw, Mich.*

The occurrence of varicosities of the ranine veins of the tongue of middle aged or older people is not unusual. With the tempo of ever increasing education of the public in regard to cancer, dentists are frequently consulted by patients with varicosities of the tongue, who fear cancer. According to Karsner[1] the dilatation of veins is due in large part to the pressure within them. Veins that are not well supported are more likely to show dilatation than those surrounded by viscera or muscle. It is at least possible that the rings around the valve may dilate more slowly than the rest of the vein and, therefore, produce a point of relative obstruction to circulation. Burket[2] has stated that distention of the ranine veins is an indication of poor circulatory efficiency, and that undue prominence of these structures warrants caution in the administration of a general anesthestic.

Thrombosis of veins, in general, is not an unusual observation at autopsy. It is found more commonly in those veins where the circulation is likely to be especially slow. The fact that thrombosis occurs in dilatations of the veins is probably due in large part to slowing of the current. In thrombosis changes may occur in the thrombus itself that may lead to organization and occlusion, calcification to form the so-called phleboliths, and lysis to produce embolism.[1] Thrombosis of the ranine veins is not a common observation.

REPORT OF CASE.—A woman, aged 64, was referred by her physician on November 22,

1. Karsner, H. T., *Human Pathology*, ed. 7. Philadelphia: J. B. Lippincott Company, 1949.
2. Burket, L. W., *Oral Medicine*. Philadelphia: J. B. Lippincott Company, 1946.

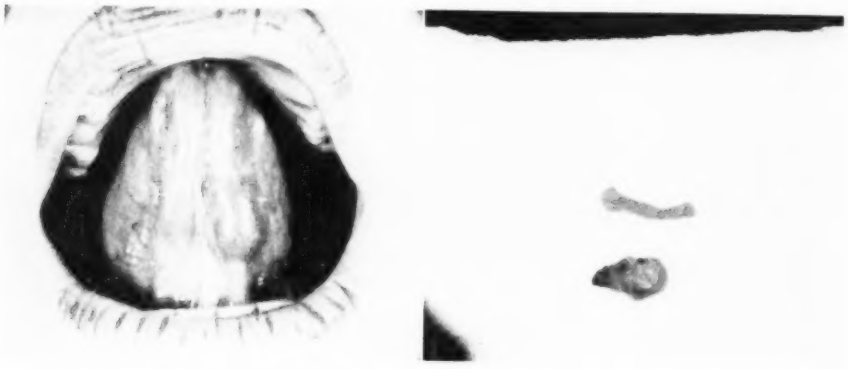


Fig. 1.—Left: Indurated enlargement near the tip of the tongue on the left, apparently within the lumen of the main branch of the lingual vein. Right: Thrombus and portion of thrombosed vein that contained the thrombus.

Fig. 2.—Postoperative view of the inferior surface of the tongue showing healing on the left side three weeks after operation. Some dilatation of the lingual vein on the right was evident.

1949, with the chief complaint of a clot under the tongue.

About two months previously the patient noticed the sudden formation of a lump under her tongue. It gradually became of smaller proportions but more indurated. The patient was anxious to have it removed.

Examination of the inferior surface of the tongue revealed an indurated, bluish enlargement near the tip of the tongue on the left and apparently within the lumen of the main branch of lingual vein (Fig. 1, left). The visible portion of the remainder of the vein was not remarkably dilated, and there were no multiple dilatations of the veins in that area.

On December 12, under local anesthesia, two ligating sutures were placed around the vein at each end of the area of induration. That portion of the vein containing the thrombus, apparent now, if not before, was exposed, sectioned, and removed (Fig. 1, right). The wound was closed with sutures.

Microscopic sections revealed a thick walled vein in which there were scattered round cells. The lining of the vein was not complete and in one area the endothelium was missing and replaced by a fibrous tissue.

The clot or thrombus measured 8 by 5 by 4 mm. Microscopic sections revealed what appeared to be a fairly well organized clot in the meshes of which there were collections of well formed erythrocytes.

The diagnosis was thrombosis of the ranine vein.

On January 6, 1950, the wound appeared well healed (Fig. 2), and the patient was discharged.

SUMMARY—A case of thrombosis of the left lingual vein is reported. Obvious thrombosis of the ranine veins is rather rare in occurrence.—*501 Second National Bank Building.*

Paget's disease: *report of case*

■ *Franklyn S. Stillman, D.D.S., Schenectady, N. Y.*

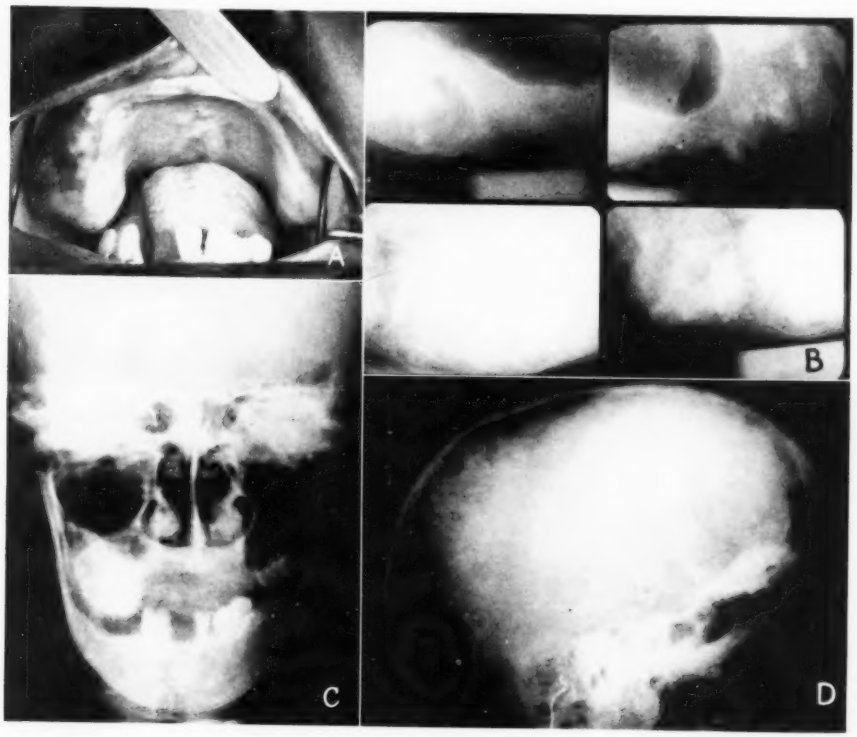
This case illustrates one of the many bizarre systemic ailments, which may be discovered in a dental examination. The patient had been examined by many physicians, but no diagnosis had been made.

This 63 year old Negro woman's chief complaint was halitosis. Oral hygiene was poor. When examined on August 23, 1948, an enlarged maxillary tuberosity was observed on the right (illustration, *A*). The patient stated that

she could not wear her full upper denture because her jaw "kept growing." She experienced no significant changes in size or shape of any other part of her body. There were no other complaints.

Dental roentgenograms of the maxilla (*B*) showed a mottled increase in bone density, more noticeable on the right. Posteroanterior and lateral views of the skull (*C* and *D*) showed the entire vault to contain a mottled appearance of increased density. The calvaria was thickened, especially in the region of the frontal bone. The posteroanterior view showed the right maxillary tuberosity to be of almost ivory like opacity. Some mottling could be seen. There was a small amount of mottling in the left mandible. Roentgenograms of the pelvis were negative.

A clinical diagnosis of Paget's disease was made on August 29. Polyostotic fibrous dysplasia was considered. Blood calcium and phosphorus reports were within normal limits. The alkaline phosphatase was elevated to 30.4 King Armstrong units (5-10 normal).



A: Maxillary tuberosity on the right side. B: Dental roentgenograms of the maxilla showed a mottled increase in bone density, more noticeable on the right (lower roentgenograms). C and D: Posteroanterior and lateral views of the skull revealed the entire vault to contain a mottled appearance of increased density. The calvaria was thickened, especially in the region of the frontal bone.

The blood chemistry and roentgenographic picture were consistent with a diagnosis of early, slightly active, Paget's disease (activity judged by elevation of alkaline phosphatase). Liver function, which influences the alkaline phosphatase level also, was reported normal.

The patient was referred to an endocrinologist, whose treatment consisted of a high calcium, high vitamin diet, with special emphasis on vitamins C and D. This was done in hopes that new bone formation can be kept in excess of bone destruction, so that if the disease affects the extremities, there will be less of a chance of fracture. There had been no oral changes when the patient was last seen on July 1, 1949.

Even though early diagnosis in this disease does not have very much of an effect on the prognosis, if early cases are referred to the research physician, he may trace the course of the disease and some day bring about a cure.—*713 Union Street.*

Tooth transplantation: *report of case*

■ *Horace M. Miller, D.M.D., Portland, Ore.*

The transplantation of teeth has fascinated the public from George Washington's time to the present. In view of the recent interest a series of transplantations and reimplantations is under progressive and continuous study at the University of Oregon Dental School, Portland, Oregon.

A boy, aged 15, was admitted to surgery March 30, 1948, with the crown of the lower right first molar badly broken down, the pulp was exposed and pulpitis was present (Fig. 1, A). This molar was extracted under mandibular block anesthesia after barbiturate premedication; the socket was prepared to receive the transplantation so that the tip of the crown would be below the surface of the bone of the socket. The lower right third molar which had roots starting to form and crown essentially complete was removed carefully to avoid trauma to the developing membrane around

Presented before the Oregon State Society of Oral Surgeons, Portland, Oregon, April 30, 1949.

Professor of Exodontia, University of Oregon Dental School, Portland, Oregon.

Fig. 1.—A: Crown of lower right first molar badly broken down, pulp exposed. Third molar starting to develop. B: Third molar transplanted in first molar position. C: Transplanted molar being forced up by bony development in the socket.

Fig. 2.—On April 27, 1949, the transplanted molar was firmly established in the arch and was pushed up into line of occlusion. Color and luster are good. The tooth is in masticating function

the roots. Sufficient bone was removed from above and around the tooth to allow easy adequate access. This growing third molar was immediately placed in the freshly prepared socket, after which the soft tissue was drawn as far as possible over the crown and held in place with sutures. Figure 1, *B*, taken July 16, indicates the position of the transplanted lower third molar in the first molar position. It is firm and protruding above the soft tissue which looks normal. The patient reported only slight pain, and there was slight swelling the first three days following the operation.

Figure 1, *C*, taken August 20, shows the transplanted molar being forced up by bony development in the socket. The tooth is firm in place and the supporting tissue appears to be normal.

Figure 2, taken April 27, 1949, shows the transplanted molar firmly established in the arch and pushed up into line of occlusion. The tooth is in masticating function. It does not respond to a vitality test; color and luster of the crown enamel are excellent. When observed in September 1949 the tooth looked and functioned well and was a good space maintainer.

A must for every oral surgeon

When did you have your last thorough physical examination? Not a cursory life insurance check up or a hasty, friendly survey by your physician associate, which consisted largely of a thump on the chest, a pat on the back and some earnest advice about working less and relaxing more, but a real basic examination which gave you a comprehensive evaluation of your physical condition.

Oral surgery is a strenuous profession. One that drains both physical and nervous energy. One that should require the operator to be as conscientious about his own health as he is of that of his patients.

As Ralph A. Johnson, M.D., recently pointed out in the *Detroit Medical News*, we as health workers know the priceless value of periodic examinations. We recommend them to our patients and to the public. We recognize that most corporations demand complete diagnostic studies of their executives as an important company investment. Yet many of us in the profession fail to apply this basic rule to ourselves. We still persist in the "do as I say, not as I do" attitude.

Each year finds an increasing number of highly skilled members dropping out of the profession or dropping off entirely because of some disability which might have been detected in the incipient stage by a thorough annual physical examination.

Ironically, many dentists, including oral surgeons, who do avail themselves of an occasional and a perfunctory physical examination give little or no attention to the health of the oral cavity. Every physical examination should be accompanied by a thorough examination of the teeth and their supporting structures. There are a number of oral conditions, other than caries, that are of more diagnostic significance to the trained observer than the average physician realizes. It is essential therefore that the dental aspects of the physical examination be made by a competent dental examiner.

If you are one of those who has neglected to take an annual inventory of his physical assets, start the new year right by having a thorough physical and dental examination immediately. You owe that much to your patients, your family, your community and yourself.

The significance of oral diagnosis

■ *Joseph L. Bernier, D.D.S., M.S., Washington, D.C.*

The separation of the diagnosis of disease into that which applies to the oral regions and that which is related to other special regions of the body, or to the body as a whole, is merely academic. Diagnosis is fundamentally an approach to the overall problems of the patient, and what these problems are cannot always be determined from the manifestations in any special region. Thus the concept of oral diagnosis must be broadened to include recognition of deviations from the normal in the physiologic processes of the human body.

The astute diagnostician will take into consideration the philosophical and biological principles of tissue behavior in order to interpret correctly aberrations in the normal physiologic body processes. Interpreting these deviations from the normal in terms of fundamental processes often makes it possible to assess their importance in arriving at a diagnosis. The natural limitations of human intelligence do not make it possible to know all the facts necessary to unequivocal diagnosis. Nevertheless the diagnostician must gather all possible information to minimize the chance of error and then select those facts which careful investigation and experience have shown to be pertinent. The pitfalls in diagnosis are many if one attempts to apply untried theories without an understanding of the basic reactions involved.

Readily available are certain diagnostic procedures and tests which often shed considerable light, provided they are used in the correct manner, where and when indicated. It is as important to select the proper time and place for a laboratory procedure as it is to employ the appropriate test. On the other hand one cannot supplant such tests by unaided clinical diagnosis, resting confidently on its superiority. To do so will only produce questionable results for even the most experienced clinician if he forsakes such diagnostic aids as x-ray and biopsy. It is obviously all the more important for the inexperienced clinician to use such aids correctly whenever they are indicated.

One facet of oral diagnosis is the evaluation of basic pathologic changes in terms of clinical symptoms. To this end one can divide these changes into broad categories representing fundamental tissue alterations. This may be done, for ex-

Colonel (D.C.) U.S. Army, Secretary and Pathologist, Registry of Oral Pathology of the American Dental Association; Chief, Dental and Oral Pathology Section, Armed Forces Institute of Pathology, Washington, D. C.

ample, by considering first those lesions which have as a primary background the process of inflammation. In another group might be placed those entities which are manifested by primary alterations in the epithelium. In this group inflammation may be a secondary but obvious feature. In a third category might be grouped those lesions in which a recognizable neoplastic change occurs.

These groups include diseases which, influenced by such factors as age and location, are represented clinically in a variety of ways.

■ *Inflammatory Lesions*

In the discussion of oral lesions which are chiefly inflammatory in character, it is necessary to consider some variations of the inflammatory process. In general, inflammation may be divided into a type which is primarily a vascular and cellular response to nonspecific agents, and therefore associated with a variety of diseases equally nonspecific in their clinical manifestations; and a second type in which the basic tissue response is chronic, decidedly more cellular, and usually attributable to a specific etiologic agent. Examples of inflammatory lesions in the first group in the oral regions are periodontitis, tonsillitis, and the changes in the oral mucosa associated with allergies. In addition, there are also other disorders in which the primary inflammatory changes may be associated with viral or rickettsial organisms rather than bacteria. Examples of lesions which might be placed in the second group are tuberculosis, Boeck's sarcoid, leprosy and syphilis. This latter group is characterized by the so-called "granulomatous" reaction. The word "granuloma" in this instance refers to the often nodular accumulation of histiocytes, lymphocytes and occasional giant cells, which is often referred to as a tubercle. Indeed, this nodular lesion has given the name "tuberculosis" to the disease caused by tubercle bacillus in which this reaction is paramount. However, an essentially similar tissue change may be seen in a variety of other diseases.

■ *Superficial Keratotic Lesions*

In the group of superficial keratotic lesions are a variety of manifestations which are difficult to diagnose because of their similar clinical appearance. For example the changes which occur in the stratified squamous epithelium lining the oral cavity in response to irritations must be separated from those seen in neoplasia.

The epithelium has as its chief purpose the covering of external surfaces. It is a maneuverable tissue in which the degree of cornification changes in response to various stimuli. Many of the lesions which occur in the oral cavity as irregular rough white areas are the result of such alterations and cannot, in the interests of complete accuracy, be designated as other than nonspecific reactions.

Under normal conditions the thickness of the stratum corneum of the oral epithelium is not appreciable. While it does vary from region to region, it never approaches the high degree of cornification that one sees on skin. Because of this it becomes important to realize that in the oral cavity the slighter degree of initial cornification makes it possible for a small amount of change to bring about a clinically demonstrable keratotic lesion.

The nonspecific white patches seen

in the mouth, when examined histologically, often prove to be nothing more than hyperkeratosis or parakeratosis which, in itself, infers only an increased thickening of the stratum corneum of the surface epithelium. Unless additional morphologic alterations are demonstrated histologically, a more specific diagnosis is not warranted. It necessarily follows, then, that one must be extremely careful in establishing any diagnosis on the basis of what can be seen only by the naked eye. In contrast to these "focal keratoses," white patches of a more serious nature may occur on the oral mucous membrane.

The two most common lesions in this category, which are seen not only in the oral cavity but on other mucous membrane surfaces and skin as well, are lichen planus and leukoplakia. They are often clinically similar to each other and to the "focal keratoses" in that they are characterized by keratotic activity. They differ widely, however, in their potentialities and prognosis. Lichen planus is a chronic dermatologic disease which, on occasion, may be manifested on the oral mucosa in the absence of any lesions on skin. It may occur as a single nodular lesion or in an annular pattern which is more common on the inner surface of the cheeks and lips. Here, thin, white strands of keratin interlace. No concern with respect to malignancy attends this disease, but treatment is difficult in that its etiology is unknown. Presumably it is associated with general debilitation and neurasthenia.

In leukoplakia, however, while the surface reaction is also keratosis, additional changes occur in the epithelium and supporting mucosa. These changes must be present to establish a definitive diagnosis of leukoplakia since that disease is usually considered to be premalignant. Accurate diagnosis can be made only by examination of tissue specimens by a competent pathologist. One hesitates to labor the point of accuracy in establishing a diagnosis of leukoplakia, but because of the widespread belief that malignant transformation may occur in this disease, the need for accurate diagnosis cannot be overemphasized. The lesions of lichen planus and leukoplakia are, of course, not the only two which occur on oral mucous membrane surfaces. Other thickenings of the epithelium include stomatitis nicotina, cheilitis glandularis, and lupus erythematosus. These are of less consequence than the true leukoplakic patch, but they must be diagnosed correctly to determine the proper treatment. It has been suggested that the nonspecific thickenings of the oral mucous membrane might, in the presence of continued irritation, undergo malignant transformation. This is difficult to accept because it has not yet been possible to demonstrate such a transformation. In the absence of proof that this transition can occur, a diagnosis should be established for those lesions which clinically resemble leukoplakia but which show no evidence of a trend toward malignant change. For this purpose the term "focal keratosis" is suggested. It is obvious that biopsy is of the greatest value in establishing a correct diagnosis for those lesions which may so closely resemble each other clinically.

■ *Neoplastic Lesions*

It is of unquestioned importance for the clinician to separate true neoplastic lesions, both benign and malignant, from

those of a hypertrophic or inflammatory nature. Since neoplastic lesions are usually referred to as "tumor," it is necessary to define this term. One cannot with accuracy consider the word "tumor" to mean swelling of every type. It is true that the designation of a swelling as "tumor" has been common in the past, but with the greater appreciation and understanding of neoplasia, the application of this term is becoming more precise. It is equally important to define the terms "malignancy" and "benignancy." The classical signs and features of malignant tumor versus those of benign tumor are listed in many standard works on pathology; however, one can hardly use these criteria for other than a superficial clinical analysis. The true nature of neoplasia is not understood, nor are the extremes of this reaction, benignancy and malignancy, clear. It is true that certain morphologic changes occur in the cell when it becomes neoplastic, but they are exceedingly complex and the reasons for them are not entirely known. In the past, alterations in the nucleus of the cell have been considered most significant. With the advent of newer cytochemical techniques, it is becoming evident that the alterations in the metabolism of cell cytoplasm are probably of equal importance. These changes are not visible under the ordinary microscope, although with special equipment some may now be measured.

It is likely that most cells participate in the maintenance of enzyme systems which permit their metabolism and specific functional activity. Once the cytoplasm undergoes change, its position in this metabolic cycle is altered, even though it may continue to be a vital link. This metabolic transformation cannot be interpreted or defined in simple terms. When the changes in the cells are more apparent, such as an obvious increase in size, irregularity in shape, and an alteration in its ability to accept stains, the transformation is readily detected. It is obvious from this that not all cellular alterations indicate malignant change, since tangential aberrations in cell metabolic behavior can be minimal so that a benign tumor results. On the other hand the variation in the cell pattern can be very prominent; for example, in the rhabdomyosarcoma when the cells assume bizarre shapes and their metabolism suffers a drastic alteration. Such a tumor can, with no difficulty, be classified as malignant. This is undoubtedly too simple an approach to this problem and is perhaps of value only in orienting thought on this subject.

One could spend a great deal of time on the discussion of the types of tumors which occur in the oral cavity, for in that area are seen not only many of the tumors which occur elsewhere in the human body, but also many others which are peculiar to that location. However, such a detailed discussion is not the purpose of this presentation. It is rather to place this group of lesions in its proper relationship to other non-neoplastic reactions with a view to simplifying detection.

The fact that certain benign lesions, such as those associated with vascular disturbances, seem to be developmental in origin, only emphasizes the number of factors which enter into the problem of establishing a correct diagnosis. The location of vascular tumors in areas with a

complex embryologic background adds weight to this factor in their histogenesis. Ectopic or heterotopic appearance of tissues, particularly in the neck, is very common, so also are developmental anomalies associated with remnants of the thyroglossal duct and the branchial clefts. All of these, as a rule, result in the production of a clinically apparent mass, but with no true neoplastic change represented in the cell itself.

Most of the lesions associated with abnormal development are benign. Histologic diagnosis of those that are malignant is simplified if the clinical and cellular aberrations are prominent. It is the borderline malignant lesion which offers the greatest challenge, since early detection and the institution of proper treatment depend on successful diagnosis in the initial stages.

■ *Comment*

Oral diagnosis cannot be considered apart from any general disease processes which are responsible for the patient's deviation from normal. Diagnosis and formulation of therapy are likely to be inaccurate if arrived at empirically, and only a thorough understanding of the fundamental processes will permit proper evaluation. This is illustrated in situations where it becomes necessary to determine whether a given tumor is sensitive to irradiation. In many instances the histologic cell type and the cellular pattern of the lesion permit the pathologist to suggest the degree of radiosensitivity.

The matter of histogenesis, therefore, often becomes extremely practical. The clinician cannot overlook this, assuming that the pathologist and the roentgenologist will supply him with information. Diagnostic acumen is displayed by the individual who can put together the opinions of experts in special fields and assess these data in relation to the case in question. He cannot depend upon the specialists to furnish him with the final diagnosis.

This suggests immediately that the clinician must constantly be on the alert for methods and means to improve his understanding of the nature of disease processes. This involves extensive and continuous study which cannot be gained by the day-to-day examination of patients alone. It is necessary to withdraw, on occasion, from the patient and study the work of those who have pursued research on the many facets of the larger problem of disease. It was an unfortunate situation when at an earlier time we in dentistry thought of oral diagnosis as centered about the decisions referrable to the construction of dentures and bridges. These matters are, of course, extremely important, but we have now come to realize that the most important aspect of oral diagnosis is that which deals with the individual as an organism and involves the understanding, detection, and treatment of diseases that are often unassociated with the mechanics of restoration.

The lips, the cheeks, the tongue, the palate, and the floor of the mouth, and perhaps even the major salivary glands, are certainly geographically within the field of dentistry. It remains for us to accept them as our moral responsibility. To do so we must accept the need for understanding the physiologic and histologic features of these areas and the pathologic changes to which they are subject. The

treatment of tumors and diseases in the region of the mouth, once the diagnosis has been established, often becomes a somewhat mechanical problem. More important perhaps is the ability of the dentist to recognize the disease, to catalog it properly, and to see that it is cared for. I think then, if you will, of oral diagnosis as the means by which the biologic knowledge which is ours may be applied to our patient, not only to provide him with an efficient masticating apparatus, but to maintain for that patient a constant and acceptable condition of general health.

■ Cancer Research

Cancer is one of the most important problems of public health in the United States. Cancer, a group of diseases manifested by abnormal growth and behavior of cells, is also an engrossing biological phenomenon. For these reasons, the problem of cancer has attracted ever-growing concern and interest of the public and scientists.

It has been realized that the solution of the cancer problem can be reached only through research. Cancer research is not a discipline separate unto itself, but depends upon simultaneous and coordinated efforts of many scientific disciplines. Its progress is stimulated by fundamental advances in the basic sciences. Cancer research, in turn, makes its contributions to the wider areas of biology, biochemistry and related sciences.—*Michael B. Shimkin, "The University of California Program in Cancer Research," California Medicine 73:297, September, 1950.*

■ Evaluation of Submaxillary Swelling

Q.—How do you evaluate submaxillary swelling just below the angle of the mandible?—*D.D.S., Minneapolis.*

A.—Such a submaxillary swelling belongs to one of three categories: infection, neoplasm, or cyst. Involvement of the lymph nodes of this region may arise from infectious inflammation or a neoplasm, either as a primary site in the node or as a metastatic barrier to pathology in tributary regions. Differential diagnosis must be based on a careful history, examination and laboratory studies often including biopsy and complete blood studies.

■ Choice of Gingival Suture

Q.—What is the suture material routinely used in the closure of gingival flaps?

A.—A practical and common suture material in oral surgery is 000 black silk and is usually used on a small curved cutting needle.

■ Exodontia During Pregnancy

Q.—Is it safe to extract teeth during pregnancy?

A.—Under the ordinary circumstances, the condition alone does not prevent routine minor oral surgery. The tendency among some dentists to hesitate in removing defective teeth because of possible miscarriage or premature labor is groundless. With the natural exception of the last several weeks before term oral surgery procedures will not alter the course of a normal pregnancy. Discretion must be used in the selection of premedicating drugs and anesthetics in view of altered metabolism and a consultation with the obstetrician may be advisable.

■ Enlargement of Lower Alveolar Ridge

Q. Enlargement of the lower alveolar ridge of one of my patients makes it impossible for him to wear a denture which was made for him two years ago. What causes might be assigned for this generalized change in the size of the jaw?

A.—Two possibilities for postdevelopmental growth of the jaws are acromegaly and Paget's disease. These gradual bone changes are progressive.

Acromegaly is caused by excessive pituitary gland function after normal skeletal growth has ceased. The characteristic features are seen as a disproportionate growth of the facial skeleton, hands and feet.

Paget's disease, or osteitis deformans, is another chronic bone disturbance of unknown cause. There is exessive production of abnormal bone which often involves the entire skull and long bones.

Both of these conditions offer good prognosis for life, but at present there is no treatment which will arrest the slow skeletal changes. Roentgenograms, blood studies and biopsy aid in a final diagnosis.

■ Diagnosis and Treatment of Moniliasis

Q.—How is thrush diagnosed and treated?

A.—Thrush, or moniliasis, is an inflammation of oral mucous membrane of infants and the debilitated adults with a lack of mouth sanitation. The lesions appear as adherent, smooth, white, raised patches which are diagnostic along with identification of the causative organism, *Oidium albicans*, by smear technic. Thrush is a contagious problem in nurseries.

Treatment is chiefly the improvement of oral hygiene. Recovery is thought to be acceler-

ated by mild alkaline mouth washes and by swabbing the lesions with 1 per cent gentian violet or 2 per cent ferric chloride several times a day. Under this routine the lesions clear in about a week.

■ Removal of Labial Frenum

Q.—When should a labial frenum between spaced central incisors be removed?

A.—It is advisable to wait until the maxillary incisors and cuspids have erupted. The space then is closed by orthodontic treatment before surgical excision of the frenum. The resultant scar tissue assists in the retention of the closure.

■ Gauze Dressings in Exodontia

Q.—When should gauze dressings be used in sockets after extractions?

A.—The functions of dressings inserted into postoperative defects in the jaws are: to provide drainage, to obliterate space, and to apply obtundant medication directly to the region. Where there is a possibility of organization of the blood clot in first intention healing, a dressing is not indicated. In larger bone defects where only a peripheral clot is viable, dressings will eliminate the central dead space and maintain a drainage opening. Although obtundant dressings are essential to postoperative comfort in many cases, they must be used with care. Improper use of dressings may delay and complicate healing processes. The dressing should not be packed against alveolar bone walls but should be placed in the central and superficial zones of the cavity. Dressings should be changed frequently and should not be continued beyond the clinical and symptomatic indications for their use. Criteria for the immediate use of postoperative dressings are based on a general appraisal of the healing course, keeping in mind the size of the operative defect, the trauma of the procedure, and the healing potential of the patient.

■ Management of the Hemophiliac Who Requires Extractions

Q.—What precautions must be taken in the case of a true hemophiliac who requires extractions?

A.—These patients must be hospitalized and managed with extreme care. The degree of prolonged coagulation time fluctuates widely and it is advisable to wait for a favorable cycle in the blood picture. Preoperative transfusions with fresh whole blood or fresh plasma are essential. The antihemophilic globulin plasma fraction loses its activity when blood is banked. All the local means of hemostasis should be provided including splints, topical application of thrombin and gelatin sponge.

■ Exodontia for the Patient With Cardiac Disease

Q.—Should only one tooth be removed at a time for the patient with cardiac disease?

A.—The patient in this classification is often advised to have no more than one tooth removed at a time. Where multiple extractions of defective teeth are indicated, such a prolonged treatment plan of repeated procedures would be both senseless and a drain upon the patient's reserve. If a conservative but rational treatment plan for the extractions is outlined for the physician, a full understanding will be reached and the patient will benefit.

■ Bones and Joint Radiology. Emerik Markovits. First edition. 446 pages, with 616 illustrations. Price $20.00. Bibliography and index. New York: The Macmillan Company, 1949.

Bones and Joint Radiology can be recommended to the dental profession, not from the viewpoint that it contains any dental information pertaining to the roentgenographic interpretation of diseases of the teeth, but for the general information given in reference to the anatomy and physiology of bone and the ossification and growth of the skeleton. Chapter 21 is devoted strictly to a discussion of the skull from the viewpoint of the radiologist; here are some 50 pages of information which can be highly recommended for reading and study. For many years the temporomandibular articulation has been the subject of general discussion by both the medical and dental professions. Both professions showed a lack of understanding of anatomy, especially the growth and development of joints. The author discusses inflammatory diseases, benign and malignant tumors and abnormalities of bones and joints in such a manner that the student or reader is soon aware that a vast amount of authentic information has been digested for him and is his for the reading. *Bone and Joint Radiology* can be highly recommended to the profession as a book containing a vast amount of usable information.—*LeRoy M. Ennis.*

■ Atlas of Oral and Facial Lesions. Ralph Howard Brodsky. First edition. 127 illustrations with 100 Kodachrome slides. Index. Price $80.00 (includes Color Film Library). Baltimore: Williams & Wilkins Co., 1949.

Dr. Brodsky presents, to the dental and medical professions, his new illustrated text, with a rather extensive collection of 100 Kodachrome slides mounted in glass. The slides are well chosen and cover the selected field with good judgment.

The sequence of the slides is in excellent order, beginning with the malignant tumors, the pathology of prime importance to the dentist, following with the benign tumors, a series on oral manifestations of systemic diseases and concluding with the blood dyscrasias and the tuberculous lesions.

Credit is given to Dr. Gustav Bucky for the development of the camera which was instrumental in taking these exceptionally fine Kodachromes, as it is extremely difficult to obtain good pictures within the confines of the oral cavity.

A small descriptive index accompanies the slides. The index includes a brief description of each slide with a diagram outlining the important features of each case. A brief note on therapy is given, and roentgenograms are included where necessary. Dr. Brodsky is a master at using brief, precise and thorough descriptions.

It appears this atlas would be an excellent way for a school, study club or young teacher to obtain a film collection, building a library around this nucleus.

It is regrettable that the cost of the text will keep it from its rightful place in the library of the dental student or general practitioner.—*William B. Martin.*

■ A Textbook of Surgery for Dental Students. G. Percival Mills and Humphrey Humphreys. Fifth edition. 368 pages with illustrations. Index. Baltimore: The Williams and Wilkins Company, 1948.

The fact that this book is now published in its fifth edition and has been reprinted four times indicates that it is a popular English text. In the preface the author states that, "It will be found to cover the requirements of the Royal College, and of those universities which publish a detailed syllabus." Their description

of the book as "a work designed solely for students and practitioners of dental surgery" might be prejudicial to some readers, this dependent on their viewpoint.

The first nine chapters, approximately half of the book, deal mainly with fundamental concepts of tissue reaction to injury, and a discussion of the various processes which take place during repair. The treatment of this subject is in the main well done. The information is concise and should serve as a satisfactory basis for further study. However, there is in this section of the book material which might be questioned. On page 68, in the discussion of hemophilia these statements occur. "As a rule, the males only are affected." "In treating such a case the styptics described under capillary hemorrhage should be tried, viper venom and thrombin being the most hopeful; should these fail, steady and prolonged pressure will be required, and this can best be done by suture, or by packing the cavity and binding the jaws together. Vitamin K may be given by injection, and blood transfusion should not be long delayed."

The remaining portion of the book is given over to the description of and the treatment for many types of pathology. Most of these are directly or indirectly connected with the problems of oral surgery. The book has a number of illustrations, some of them in color. For a book of but 361 pages, it contains information covering an unusually large number of subjects. Perhaps its greatest use would be that of a guide to collateral reading.—*Warren B. Schram.*

■ CLINICAL PATHOLOGY. Benjamin B. Wells. First edition, 397 pages, with 32 illustrations. Index. Price $6.00. Philadelphia and London: W. B. Saunders Co., 1950.

In the foreword, page iii, the author quotes Jos. M. Toner, who wrote in 1874: "There are some hundreds of young physicians, of first class ability, noted for their originality of thought and boldness of investigation, residing in different parts of our country, who are working with scalpel, the microscope, and test tube in the spirit of true philosophers. But where we have ten such, we ought to have a hundred. It is from among these must come the leading medical men of the future." Although still partly true this hope has been attained in part and the result is the practice of the specialty of clinical pathology and the excellence of the clinical laboratory service in medicine and dentistry.

This textbook, however, is in no sense a laboratory manual but is intended to supply the physician, the dentist and others who use clinical laboratories with the information and background needed to secure from the clinical laboratory adequate aid in the diagnosis and treatment of disease. There are nine chapters and an appendix, one on infectious diseases, six covering the group systems, and one each on clinical laboratory studies in surgery and obstetrics. The author believes that the practitioner who intends to use a laboratory test should at least know: (1) when to use the test; (2) how to interpret the laboratory report and the result of the test; (3) what technical and physiological limitations must be accounted for in this interpretation. This information is supplied in such a way that it is easily found and readily understood.—*E. H. Hatton.*

■ GRANULOMATOUS INFLAMMATION: ITS NATIVE, GENERAL PATHOLOGICAL SIGNIFICANCE. Wiley D. Forbus. 58 pages with illustrations. Price $1.85. Springfield, Ill.: Charles C Thomas, 1949.

This is a small book of 58 pages including three pages of references to other works on the subject. The binding and printing of the book have been unusually well done. There are 25 illustrations, most of which are photomicrographs.

The author's treatment of his subject is well outlined in his introduction as he states his five main objectives: (1) the presentation of a brief review of the basic pathological processes involved in granulomatous inflammation; (2) the reorientation of certain basic pathogenic factors involved in granulomatous

inflammation; (3) the illustration of the proposed change in emphasis necessary to the reorientation of the question of granulomatous inflammation by means of a description of certain observations recently made in our own work on one of the more unusual infectious granulomata; (4) a brief statement of the importance and general pathological significance of granulomatous inflammation; (5) the brief description of the distinguishing clinical characteristics of granulomatous disease.

Dr. Forbus presents his material in an academic manner, and yet much of it has direct clinical application. As an example, on page 52 it is stated, "Granulomatous inflammatory reactions are characteristically poor in circulation. An important result of this is difficulty in reaching the etiologic agents with therapeutic materials introduced into the blood."

This book seems to present much fundamental information on the subject, and on not too many pages.—*Warren R. Schram.*

■ Bacterial Infection with Special Reference to Dental Practice. J. L. T. Appleton. Fourth edition. 644 pages, with 108 illustrations and 5 plates, 4 in color. Index. Price $10. Philadelphia: Lea & Febiger, 1950.

This edition like the preceding ones has many of the characteristics of a review of the literature, the references and citations are very generous and comprehensive and there is a tendency to allow the reader to make his own deductions and draw his own conclusions. In other ways this is a different sort of textbook. The author assumes that the necessary approach to an understanding of the part played by bacteria in dental practice is a working familiarity with the process of infection, and of the bacteria that produce infections. The 40 chapters, therefore, naturally fall into three parts covering the three phases of the book content. It is by far the best coverage of this subject known to me which is more than adequate compensation for the load placed on the reader, as it is not easy reading and dictionaries should be handy to get the most out of it.

The chapters covering how bacteria produce disease (9, 10, 11) are highly commended; chapter 7 on sterilization and related subjects should be carefully studied by all practicing dentists; and the chapters on dental caries, focal infection and the pulpless tooth are equally worth careful study, especially the last paragraph on page 539. On the whole the author seems more favorably impressed with the focal infection concept as applied to the chronic infections about the teeth than is justified by the current judgment of clinicians. There is no doubt but that the principle of focal infection is a fully established bacteriological concept and that the spread of bacteria from some point of entry to other parts of the body is a well known occurrence, to use the author's own words. On the other hand the opinion quoted in the middle paragraph on page 525 may be more favorable to the concept than is deserved.—*Edward H. Hatton.*

■ Malignant Tumors of the Cheek in Children. G. E. Ward and E. R. Shipley. Am. J. Roentgenol. 60:758, December, 1948.

Ward and Shipley report one case of a malignant anaplastic tumor of the right antrum in a Negro girl, aged 4, and one case of a low grade malignant tumor arising from aberrant salivary tissue in a white female infant, aged 8 months. The older child received a large and early course of radium therapy. The dose was a necrotizing one and has caused considerable deformity of the eyelid and upper lip, but with one or more plastic procedures a good cosmetic result is to be expected. The patient has had no recurrence and is living a normal life five years later. The second patient received a relatively small dose of radiation (200 r per day for a total of 1,800 r), but the process continued and caused the death of the child. The favorable result obtained in the first case was due to the localized nature of the tumor, the early use of a large dose of radium and the sensitivity of the tumor to radium. Although salivary tumors of the cheek are rare, the possibility of their occurrence should be recognized and early therapy instituted.

■ Aureomycin in Soft Tissue Infections. Myra A. Logan, William I. Metzger, Louis T. Wright, Aaron Prigot and Edwin A. Robinson. Am. J. Surg. 79:229, February, 1950.

The relative lack of toxicity of aureomycin, an antibiotic substance introduced in 1948, led to a study at Harlem Hospital to determine the drug's value in soft tissue infections.

Aureomycin was used in 182 surgical infections of the soft tissues which are divided into the following groups: cellulitis, perirectal infections, peripheral ulcers, lymphadenitis (primary), traumatic cases, gas gangrene infections and a miscellaneous group.

Infections caused by a variety of gram positive and gram negative bacilli were successfully treated. Most of the infections were caused by Staphylococci or beta hemyoltic Streptococci. In general, different strains of the same organism are inhibited by the same, or nearly the same concentration of aureomycin. There is apparently no increase in resistance to aureomycin in instances in which the same organism was isolated more than once from the same patient in cases in which prolonged administration was necessary.

No uncontrollable toxic reactions to the drug were observed.

The age of the patients and medical complications did not hamper the activity of the drug.

Aureomycin was used effectively by the oral, intramuscular and intravenous routes and, on the whole, results were comparable.

Most of the patients in this study received either 300 mg. of intravenous aureomycin twice daily or 250 mg. of oral aureomycin three times daily. When given intravenously, the drug was administered in 500 cc. of 5 per cent glucose in distilled water. The infusion was adjusted so that the total dosage was administered within one hour.

A mild, temporary, chemical phlebitis occurred in approximately 15 to 20 per cent of the cases in which aureomycin was administered intravenously. The authors state that the phlebitis has been eliminated since they have changed from the use of sterile distilled water to the use of a leucine buffer as a diluent.

It is of interest to the oral surgeon that in all patients with cellulitis treated before actual necrosis or pus formation, the infection subsided promptly. It did not in any case proceed to fluctuation. Aureomycin has yielded satisfactory results in the treatment of infections whether used alone or as an adjunct to indicated surgery.

■ Vitallium Reconstruction of the Malar Bone. William P. Kleitsch. Arch. Surg. 60:503, March, 1950.

Complete or partial loss of the malar bone is a condition seldom seen in civilian life but was frequently seen in World War II as a result of the extensive use of high explosives. Because of its superficial location and flimsy attachments, this bone is the natural recipient of much of the trauma directed at the face and side of the head. The author of the article further discusses the mechanism involved in injuries producing loss of the malar bone.

A material used for the plastic reconstruction of this bone must meet these qualifications: (1) nonirritating to tissues; (2) strength; (3) susceptible to firm mechanical anchorage; (4) permit accurate shaping. Bone and cartilage do not permit accurate modeling and anchorage; tantalum is too malleable; acrylic is too susceptible to fracture. Vitallium satisfies the requirements listed.

The prosthesis is prepared by first making a plaster cast of the face. An accurate prosthesis is fashioned out of dental stent and then sent to a dental laboratory for casting in Vitallium. The finished Vitallium prosthesis is then wired to the ends of the superior orbital ridge, the inferior orbital margin and the zygomatic process of the temporal bone.

A representative case is presented in detail in this article.

■ Cancer of the Lip. Bernard Pierre Widmann. Am. J. Roentgenol. 63:13, January, 1950.

The article evaluates the results of various technical procedures of irradiation employed on 363 cases of cancer of the lip at the Philadelphia General Hospital during the last 20 years. On the basis of the survey, the author claims a possible curability of 83 per cent, by irradiation procedures, of all types of early and advanced cancers of the lip without lymph node involvement. These good results, the marvelous cosmetic effects, the skin and physical tolerance for adequate doses of irradiation in individuals of varying ages, health and strength, imply that cancer of the lip is basically a roentgenologic problem. The review shows that roentgen rays and radium have produced equally good results and emphasizes the importance of predetermining the plan of treatment which will allow the administration of total doses of roentgen rays and radium to the limit of skin tolerance according to the size of the field and the rate of fractionation of daily intensities of irradiation, rather than any dose calculated according to the specific grade or cellular differentiation of the tumor. The technical procedures of irradiation are discussed and described in detail.

■ Acute Acetylsalicylic Acid Intoxication. B. L. Lipman, S. O. Kransnoff and R. A. Schless. Am. J. Dis. Child. 78:477, 1949.

Five cases of acetylsalicylic acid intoxication in three infants between the ages of 5 and 6 months, and in two adults aged 54 and 21, are reported. One infant died 14 hours after the ingestion of 2.56 Gm. and one adult died three hours after the ingestion of 5 to 6.1 Gm. Symptoms are the result of damage to the brain, kidneys and liver and concomitant changes in the electrolyte balance. The first stage of salicylate poisoning is a state of respiratory alkalosis followed by the stage of compensated acidosis. The final stage is decompensated acidosis, with depletion of the alkali reserve, decrease in the blood pH and failure of the respiratory center in its attempt to achieve compensation.

Treatment in the early stages consists of cessation of use of the drug and gastric lavage with tap water. It is essential to give 5 or 10 per cent dextrose solutions intravenously to maintain fluid balance and provide carbohydrate. In the later stages of acidosis, alkalinizing solutions in sufficient amounts to correct the deficit of base should be administered. Vitamin K and ascorbic acid should be given in all cases. For adequate antipyresis or analgesia 0.09 Gm. of acetylsalicylic acid per kilogram of body weight need not be exceeded as the daily dose for infants and young children.

■ THYROGLOSSAL TRACT ABNORMALITIES—CYSTS AND FISTULAS. Grant E. Ward, James W. Hendrick, and Robert G. Chambers. Surg., Gynec. and Obst. 89:727, December, 1949.

These authors give a very comprehensive analysis of 105 cases of thyroglossal tract abnormalities from Johns Hopkins Hospital observed during the years 1926 to 1946. A brief review of the embryology is given. The anlage of the thyroid gland has its beginning as an evagination from the floor of the pharynx. This diverticulum makes its way downward in the neck in the median line to a point below the thyroid cartilage where it terminates as the pyramidal lobe of the thyroid gland. The tongue develops after the thyroid anlage and the termination of the thyroglossal duct is buried within its substance at the foramen cecum of the tongue. Normally the epithelial lining of the tract undergoes degeneration and disappears. When degeneration fails to take place, cysts or fistulas may occur anywhere along the course between the foramen cecum and the suprasternal notch.

Of the 105 cases, 60 per cent occurred between birth and the age of 10 years. This occurred with equal frequency in the male and female and presented in a variety of locations: intratongue; submental region; suprahyoid; at the level of the hyoid; infrahyoid; suprasternal; in the midline; to the right of the midline; to the left of the midline. The authors stress the point that these abnormalities do not always occur exactly in the midline which may account for confusion in diagnosis in some instances.

Infection occurring in these cysts is often the first symptom. Ten of the patients were admitted with extensive cellulitis and in six instances incision and drainage was necessary. The lesions may vary from several millimeters to 6 or 7 cm. in diameter. A cyst located in the tongue usually presents the most alarming symptoms such as dysphasia, dysarthria and choking sensations. Cysts in the submental and suprahyoid areas may cause tenseness and mild choking attacks.

The cyst content is of a mucoid nature unless infection makes it purulent. Infection may cause rapid increase in size with pain and tenderness and thickening of the walls. In two cases there was a direct communication between the cyst and the foramen cecum and pressure on the cyst caused discharge through the foramen cecum. If a cyst is lanced a sinus tract results. Thirty-four per cent of the patients in this series were first seen with sinus tracts. Incision and drainage of a noninfected cyst, under any circumstances, is to be condemned.

Of the 62 patients who presented with a definite cyst, 76 per cent were midline lesions, 24 per cent were lateral to the midline. In this group 85 per cent had cysts below the hyoid bone. There were 28 lesions above the hyoid bone.

In making the diagnosis of thyroglossal tract cyst or fistula it must be remembered that the cyst or fistula may occur any place in the base of the tongue to the suprasternal notch and that these abnormalities are the most frequent cysts or fistulas occurring in that area. These cysts are smooth, ovoid, or round and translucent when examined with a transmitted light.

These cysts must be differentiated from a dermoid tumor, lipoma, sebaceous cyst, or from an enlargement of the pyramidal lobe of the thyroid gland, and enlarged lymphatic glands of the cricothyroid membrane. The cysts move up and down with deglutition and in the majority of cases movement of the cyst can be associated with movement of the hyoid bone. This was true in 85 per cent of the cases.

If a thyroglossal tract fistula or sinus communicates with the oral cavity it always does so at the foramen cecum, whereas branchial cleft fistulas or sinuses open at Rosenmueller's pouch in the lateral pharyngeal wall.

The authors state the treatment is entirely surgical, that irradiation and sclerosing solution have no place in the management of these problems. It is imperative that the entire epithelial tract be removed or a cyst or fistula will recur. The intralingual cyst may be removed intraorally, the other, however, are best approached through a transverse incision over the cyst, enucleation of the cyst, and also its tract, following it to the base of the tongue. A section of the hyoid bone should be removed in all cases of cyst below the hyoid. Failure to do this where the thyroglossal duct transverses the region of the hyoid may result in recurrence.

In the entire series there were 13 recurrences and all but 2 of these occurred in cases where no hyoid bone was taken at the first operation. In the 2 cases where the hyoid bone had been partially excised it was felt that the excision had been inadequate.

The authors conclude that in order to quickly eradicate this lesion it is necessary to remove completely all epithelial remnants and in all lesions at the level of the hyoid bone or below to take 1 cm. of the central part of the hyoid bone and a block of tissue well around the sinus or fistulous tract. Simple dissection of the cyst without removal of the pedicle, scraping and cauterizing, injection of sclerosing solution, lancing of the cyst and treating the abnormality with roentgen ray or radium, give unsatisfactory results.

CLINICAL EVALUATION OF AUREOMYCIN. H. Brainerd and others. J. Clin. Investigation 28:992, September, 1949.

Brainerd and his associates used aureomycin in the treatment of 116 patients with infections due to a variety of bacterial, rickettsial and viral agents. Adult patients were given 1 Gm. every four to eight hours by mouth. Nausea and vomiting were the only significant toxic symptoms encountered. The intravenous route of administration was used in 68 persons to supplement oral medication or to replace the oral route in the control of nausea. Aureomycin exerted beneficial effects in acute brucellosis, leptospirosis, Q fever, primary atypical pneumonia, psittacosis, chancroid, lymphopathia venereum, generalized peritonitis and many infections of the urinary tract.

■ FURTHER EXPERIENCES WITH INTRAVENOUS AUREOMYCIN THERAPY. M. Saunders and others. J. Clin. Investigation 28:1006, September, 1949.

The need for developing routes of administration for aureomycin other than oral has been apparent since the initial clinical trials. The observations on 116 patients who were given aureomycin intravenously are reported. Absorption of aureomycin in the blood appears to vary with the individual patient. Caronamide may enhance blood levels of aureomycin and it definitely decreases excretion of the antibiotic through the kidneys. No serious toxic effects have been noted following intravenous aureomycin therapy. Only two patients experienced febrile reactions. These reactions appeared to be of an individual nature, since the same production lots failed to evoke reactions in other patients. Phlebitis occurred in 30 to 40 per cent of the patients when the antibiotic was given intravenously.

■ HYPOPLASIA OF THE MANDIBLE (PIERRE-ROBIN SYNDROME) WITH COMPLETE CLEFT PALATE. Selected Papers of the Carle Hospital and Carle Foundation. 3:5, January, 1950.

Pierre Robin first called attention to the syndrome of hypotrophy of the mandible with associated glossoptosis and described the respiratory difficulties and the nutritional deficiencies in these patients. A case of an infant with micrognathia, complete bilateral cleft palate and glossoptosis with subsequent severe respiratory difficulty was observed at Carle Memorial Hospital. The physical abnormalities of this infant required her to utilize nearly all energy in respiratory effort; consequently, growth and weight gain were slight. She failed to respond to conservative measures and expired at the age of eight months. In retrospect, it was regretted that tracheotomy was not attempted.

■ HYPERTROPHY OF PAROTID GLANDS AND DIABETES MELLITUS. K. Mellinghoff. Klin. Wchnschr. 26:641, November, 1948.

Having observed a decided change in the facial contours of some patients with diabetes mellitus, which was found to be due to enlargement of the parotid glands, Mellinghoff decided to investigate whether this hypertrophy of the parotid glands is of significance in the metabolic disturbance which characterizes diabetes. He presents the histories of five patients which suggest that the hypertrophy of the salivary gland in the diabetic patient usually is a part of a syndrome of endocrine disturbances in which extrainsular disturbances

play a part. The author is of the opinion that the enlargement of the salivary glands, particularly of the parotid and sometimes of the lacrimal glands, is a reaction resulting from hormonal stimulation which can be compared with any other distant symptom in the course of endocrine disturbances, such as exophthalmos, hyperostosis frontalis and striae distensae. Parotid hypertrophy has been observed in obese patients without signs of disturbances in the carbohydrate metabolism, in various endocrine disorders and even after ovariectomy, most probably by the intermediate action of the hypophyseal system.

■ REEVALUATION OF ETHYL ALCOHOL AS A GERMICIDE. Philip B. Price. Arch. Surg. 60: 492, March, 1950.

In this article the author reports an extension of earlier studies on this subject. The methods include *in vitro* studies of the germicidal effect of varying strengths of ethyl alcohol for varying lengths of time, using *Staphylococcus albus*, *Staph. aureus* and *Escherichia coli*. Concentrations of solutions tested were from 10 per cent to 99 per cent alcohol by weight. The lengths of time of contact between organisms and germicidal solution varied from one second to ten minutes. It was found that concentrations of from 60 to 90 per cent were strongly and rapidly germicidal in a few seconds. The *Staph. albus* organisms were found to be more resistant than the others used in the tests.

Disinfection of the skin was also studied. After a routine scrubbing with soap, followed by rinsing and drying, the hands were immersed and rubbed in solutions in each of a series of basins containing 20 per cent alcohol by weight in the first test. Another series of tests was run using 40 per cent concentration of alcohol, and other series employing 60, 70, 80, 92 and 99 per cent respectively were run. It was found that solutions of alcohol increase in skin disinfectant power as their concentration increases up to 70 per cent. Higher concentrations had no further disinfectant power.—*H. J. Bloom.*

■ BENIGN HYPERPLASIA OF THE MANDIBULAR CONDYLE. Robert H. Ivy. Plast. and Reconstruct. Surg. 4:445, September, 1949.

In this paper the author describes the relatively rare pathological condition of benign hyperplasia of cartilage and bone of the mandibular condyle. A case is reported with a simplified method for the condylectomy procedure.

The pathology is slowly progressive, exhibiting a gradual vertical elongation of the ascending ramus on the affected side and a deviation of the chin to the opposite side. A "cross bite" occlusion is another clinical sign. Usually there is no abnormal condylar action but there may be some pain on motion in the region of one or both condyles as the case progresses. The enlargement can be palpated and clinical findings will be sustained by roentgenographic examination.

Although described earlier, the first case to be treated by resection of the condyle was by Eckert in 1899.

The case reported was that of a 38 year old woman with the signs and symptoms described progressing over a period of several years. Under endotracheal anesthesia the Risdon approach was made by a curved incision approximately 2 inches long beneath and behind the angle of the mandible. Part of the attachment of the masseter muscle was then reflected from the lateral surface of the ramus. A Blair curved pedicle needle was then passed along the medial aspect of the ascending ramus until it emerged through the sigmoid notch just beneath the zygomatic arch. The needle was then exposed by a stab incision of the skin and was threaded so that a Gigli saw was carried around the neck of the condyle. The condyle was easily cut and removed after dissecting free the soft tissue attachments. Oxidized gauze dressing was used to control bleeding.

The author believes this method of approach affords not only an easier and more rapid approach but also involves less danger of seventh nerve complications and results in less mutilation of the pathological specimen.—*Albert S. Lasky.*

Announcements

■ Two Specialties Approved by the House of Delegates

The House of Delegates, at the ninety first annual session of the American Dental Association in Atlantic City October 30 to November 2, voted to approve the requirements of the American Board of Oral Pathology after the Council on Dental Education found that this Board met the requirements for the approval of examining boards in dental specialties.

In another resolution, the House of Delegates approved the recommendation of the Council on Dental Education to include public health dentistry in the list of specialties.

■ American Dental Association Appoints Oral Pathology Fellow

Francis V. Howell, of the College of Physicians and Surgeons, San Francisco, has been appointed a Fellow in oral pathology to serve at the Armed Forces Institute of Pathology. The announcement was made by Lt. Col. Joseph L. Bernier, executive secretary of the A.D.A. Council on Dental Museum and Registry.

The Council appointed Dr. Howell to a one year's residency at the Institute, beginning on September 1.

■ International Congress Invites Participants

The eleventh International Dental Congress will be held in London July 19-26, 1952, under the auspices of the Fédération Dentaire Internationale.

The congress, presided over by E. Wilfred Fish of England, will include scientific papers, clinical and table demonstrations, scientific exhibits, films of dental interest, a dental trade exhibition and an oral hygiene exhibition.

Dental research workers, teachers and dental practitioners are invited to contribute presentations to any section of the congress. They should write to G. H. Leatherman, Honorary Secretary, 13 Hill Street, London, W.1. American Express Company is prepared to take care of transportation and hotel reservations, as well as shipment, storage and customs clearance of demonstration material. Dentists who plan to attend the congress are urged to make hotel reservations as early as possible.

■ New Dental Specialty Groups Formed in Chile

Announcement has been received from Chile of the establishment in Santiago of three new societies: a dental public health society with Dr. Ismael Carmona as its president; an oral pathology society with Dr. Luis Ilabaca as president, and an oral surgery society with Dr. Pedro Peña as president.

■ Southeastern Oral Surgeons Will Meet in New Orleans

The Southeastern Society of Oral Surgeons will hold its second annual meeting March 2-3, 1951, at the Roosevelt Hotel in New Orleans.

■ Louisiana to Stage Cancer Detection Institute

The Louisiana State Dental Society will stage a cancer detection institute in January at the Charity Hospital, New Orleans, in cooperation with Loyola University and the Louisiana State Health Department. Patients will be presented for study and models will be used for demonstrations of detection and treatment.

■ Internship Available in Oral and Maxillofacial Surgery

There will be an internship available in the Oral and Maxillofacial Surgery Department of Geisinger Memorial Hospital on January 1, 1951. This service consists of one year of internship followed by one year of residency.

Application forms may be obtained by writing to Dr. James B. Smith, Department of Oral Surgery, Geisinger Memorial Hospital and Clinic, Danville, Pa.

■ Eighth Pacific Coast Dental Conference

The eighth Pacific Coast Dental Congress will be held in Seattle June 25-28, 1951. The scientific program, exhibits and clinics will be housed in the Civic Auditorium, and the Olympic Hotel will serve as headquarters for the meeting.

Held in conjunction with Seattle's 1951 "Seafair" and centennial celebration, the congress promises visitors a week of education and entertainment.

■ American Society of Oral Surgeons Elects New Officers

At the thirty-second annual meeting of the American Society of Oral Surgeons, the following officers were elected: Horace L. Cartee, Miami, Fla., president; W. T. Ewing, Akron, Ohio, president-elect; D. C. McRimmon, Fort Worth, vice-president; A. P. Williams, Louisville, Ky., secretary-treasurer; Ralph B. Rode, St. Louis, newly elected member to executive council. Miss Ruth F. Whalen was appointed executive secretary, with headquarters at 1112 S. Clay Street, Richmond, Virginia.

■ Ohio State University Announces Postgraduate Courses in Dentistry

The Ohio State University, College of Dentistry, announces the following schedule for its postgraduate courses in dentistry to be presented during the winter of 1951:

Oral Surgery	D. P. Snyder	February 5-9
Oral Pathology and Diagnosis	H. B. G. Robinson	February 12-16
Anatomy of Head and Neck	L. F. Edwards	March 19-23

Each course is given for five consecutive days, Monday through Friday, and the fee for each course is $50, except for oral surgery, which is $100. All of the courses have been approved by the Veterans Administration. The classes are limited to ten men each, giving opportunity for discussion and personalized instruction.

Further information and applications may be secured from the Postgraduate Division of the College of Dentistry, Ohio State University, Columbus 10, Ohio.

■ Twelfth Congres Francais de Stomatologie

The twelfth French Congress of Stomatology will be held in Paris, during the first two weeks of October, 1951. The executive board consists of: president, Dr. Rene Vincent; vice presidents, Dr. Vilenski and Dr. Carvallo; general secretary, Dr. P. Friez; treasurer, Medecin General Ginestet.

Those planning to attend the Congress and particularly those wishing to contribute to the scientific program are requested to notify the general secretary as early as possible.

Address correspondence to Dr. P. Friez, 42 rue Notre-Dame de Champs, Paris 6, France.

■ Dental Anesthesia Residency Open at Doctors Hospital, Washington, D. C.

A dental anesthesia residency for selected postgraduate students of dental surgery is offered by Doctors Hospital, Washington, D. C., with the appointment being made each January 1 or July 1. Length of service is for either 6 or 12 months with maintenance.

The student will assist with general anesthesia for surgery and obstetrics and will participate in preoperative and postoperative routine care in the hospital. The appointee will attend anesthesia conferences and lectures at least four hours a week and will participate in daily clinical conferences in the operating room.

This opportunity is offered only to students who are working for a Master's degree or who intend to specialize in oral surgery. The objective of the residency is to give a basic background in anesthesiology with clinical experience in 300 to 750 cases exclusive of dental surgery.

Further information may be obtained by writing to Harold Krogh, D.D.S., 1835 Eye St., N.W., Washington 6, D. C.

■ Fellowship in Oral Pathology

Lt. Colonel Joseph L. Bernier announces the availability of a Fellowship in Oral Pathology at the Armed Forces Institute of Pathology. The Fellowship is sponsored by the American Dental Association as one of the activities of its Council on Dental Museum and Registry. The Fellowship may be filled at any time and is initially for a one year period from time of appointment. Renewal for a subsequent year is possible. The training received is creditable toward the American Board of Oral Pathology.

For further information write Lt. Colonel Joseph L. Bernier, Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

■ Examination by the American Board of Oral Surgery

The American Board of Oral Surgery will meet at the Blackstone Hotel in Chicago on April 7-10, 1951, at which time examinations for certification will be held.

Requests for application forms or additional information should be addressed to Dr. Leslie M. FitzGerald, 718 Roshek Building, Dubuque, Iowa.

Editorial communications

■ ORIGINAL COMMUNICATIONS—This journal invites concise original contributions in the broad field of clinical and experimental surgery of the mouth and associated structures, including roentgenology, diagnosis, anesthesia and oral surgical pathology. Articles are accepted for publication with the understanding that they are contributed solely to the JOURNAL OF ORAL SURGERY. All manuscripts are subject to editorial modification. Neither the editors nor the publishers accept responsibility for the views and statements of authors expressed in their communications.

■ MANUSCRIPTS—Manuscripts submitted for publication should be sent to Reed O. Dingman, Editor, 221 North Ingalls Street, Ann Arbor, Michigan.

Manuscripts should be typewritten on one side of the paper only, with double spacing and liberal margins. The author's name and the abbreviated title of the article should appear at the top of each manuscript page. The original should be sent to the editor and a carbon copy retained by the author. Manuscripts will not be returned if accepted for publication.

References should be placed at the end of the article and should conform to the style of the Quarterly Cumulative Index Medicus; viz., name of author, title of article and name of periodical with volume, pages, month and year. They should be numbered and should appear in the same order as that of the superior figures inserted in the appropriate positions in the text.

■ ILLUSTRATIONS—Illustrations accompanying manuscripts should be unmounted and numbered. The author's name should appear on the margin or back.

Authors should insert figure numbers at appropriate places in the text. The original drawings, or glossy print photographs of them, should accompany the manuscript. Legends for illustrations are to be typewritten in a separate list with numbers corresponding to those on the photographs and drawings.

A reasonable number of halftone illustrations will be reproduced free of cost to the author, but special arrangements must be made with the editors for color plates, elaborate tables or extra illustrations. Copy for zinc cuts (such as pen drawings and charts) should be drawn and lettered in India ink or with black typewriter ribbon (carbon paper placed with carbon against back of sheet for bolder type). Ordinary blue or colors will not reproduce. Only good photographic prints or drawings should be supplied for halftone work.

■ CASE REPORTS—Case reports will constitute an important department of the journal and the editors welcome case reports that are of unusual clinical value or that present exceptional conditions of interest to dental surgeons.

■ EXCHANGES—Letters, exchanges, reprints and all other communications relating to the JOURNAL OF ORAL SURGERY should be sent to the American Dental Association, 222 East Superior Street, Chicago 11.

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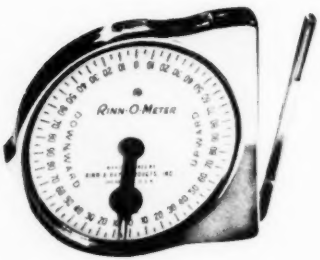

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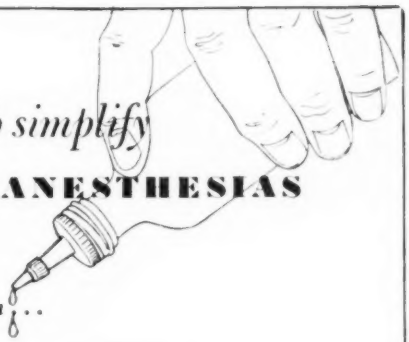

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